



PLEASE CHECK FOR CHANGE INFORMATION
AT THE REAR OF THIS MANUAL.

**7B53A/7B53AN
DUAL TIME BASE**

INSTRUCTION MANUAL


**Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077**

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INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag,
or stamped on the chassis. The first number or letter
designates the country of manufacture. The last five digits
of the serial number are assigned sequentially and are
unique to each instrument. Those manufactured in the
United States have six unique digits. The country of
manufacture is identified as follows:

B000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom, Ltd., London
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700000	Tektronix Holland, NV, Heerenveen, The Netherlands

TABLE OF CONTENTS

	Page		Page
LIST OF ILLUSTRATIONS	iii	Section 3	THEORY OF OPERATION
LIST OF TABLES	iv		(cont'd)
OPERATORS SAFETY SUMMARY	v		Delayed Trigger Generator
SERVICE SAFETY SUMMARY	vii		(SN B209999 & Below)
Section 1	SPECIFICATION		3-12
	1-1		Delayed Sweep Generator
Section 2	OPERATING INSTRUCTIONS		3-17
	2-1		3-18
	Controls and Connectors	Section 4	CALIBRATION
	2-1		4-1
	Operating Checkout		Test Equipment Required
	2-3		4-1
	General Operating Instructions		PART 1 PERFORMANCE CHECK
	2-6		4-6
	Applications		Trigger System Check
	2-13		4-7
	Repackaging for Shipment		Horizontal System Check
	2-20		4-13
			PART 2 ADJUSTMENT
			4-20
			Trigger System Adjustment
			4-21
			Horizontal System Adjustment
			4-24
		Section 5	MAINTENANCE
			5-1
			Preventive Maintenance
			5-1
			Troubleshooting
			5-2
			Corrective Maintenance
			5-4
		Section 6	OPTIONS
			6-1
		Section 7	REPLACEABLE ELECTRICAL PARTS
		Section 8	DIAGRAMS AND CIRCUIT BOARD
			DESCRIPTIONS
		Section 9	REPLACEABLE MECHANICAL PARTS

WARNING

The remaining portion of this Table of Contents lists the servicing instructions. These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that called out in the operating instructions unless qualified to do so.

LIST OF ILLUSTRATIONS

Fig. No.	Page	Fig. No.	Page
	7B53A/7B53AN Dual Time Base		viii
2-1	Location of release latch.	4-2	Typical delay time error measurement.
2-2	Front-panel controls and connectors.	4-3	Typical Delay Time Error Figures.
2-3	Frequency range of each COUPLING switch position.	4-4	Allowable Delay Time Error.
2-4	Effect of LEVEL control and SLOPE switch on CRT display.	4-5	Typical CRT display when checking sweep length.
2-5	Composite Time/Division switch.	4-6	Typical CRT display for adjustment of DI'd Sweep Start and DI'd Sweep Stop.
2-6	Area of graticule used for accurate time measurements.	5-1	Location of pins on interface connector.
2-7	Operation of Sweep Magnifier.	5-2	Cam Switch Removal.
2-8	(A) Intensified Sweep display; (B) Delayed Sweep display.		The illustrations in Section 8 are located near their associated diagrams on the foldout page.
2-9	Typical Mixed Sweep display (DELAY TIME MULT dial set to 3.55).	8-1	Electrode configuration for semiconductors in the instrument.
2-10	DELAY TIME MULT dial. Reading shown 3.55.	8-2	Location of circuit boards in the 7B53A/7B54AN.
2-11	Measuring the time duration between points on a waveform.	8-3	Partial A1—Interface circuit board component locator (SN B090000 and up).
2-12	Measuring risetime.	8-4	Partial A1—Interface circuit board component locator (SN B089999 and below).
2-13	Measuring time difference using delayed sweep.	8-5	A2—Source Switch circuit board component locator.
2-14	Using delayed sweep for magnification.	8-6	A3—Coupling Switch circuit board component locator.
2-15	Displaying a complex signal using delayed sweep.	8-7	Partial A4—Trigger circuit board component locator 7B53A only (SN B210000 and up).
2-16	Measuring pulse jitter.	8-8	Partial A4—Trigger circuit board component locator (SN B209999 and below).
3-1	7B53A/7B53AN Simplified Block Diagram.	8-9	Partial A6—Sweep circuit board component locator (SN B090000 and up).
3-2	Trigger Preamp and Input Switching Block Diagram.	8-10	Partial A6—Sweep circuit board component locator (SN B089999 and below).
3-3	Main Trigger Generator Block Diagram (SN B210000 and up 7B53A only).	8-11	A5—Mode Switch circuit board.
3-4	Main Trigger Generator Block Diagram (SN B209999 and below).	8-12	Partial A4—Trigger circuit board component locator 7B53A only (SN B210000 and up).
3-5	Main Sweep Generator Block Diagram.	8-13	A7—Delayed Trigger Switch circuit board component locator.
3-6	Delayed Trigger Generator Block Diagram (SN B210000 and up 7B53A only).	8-14	Partial A4—Trigger circuit board component locator (SN B209999 and below).
3-7	Delayed Trigger Generator Block Diagram (SN B209999 and below).		
3-8	Delayed Sweep Generator Block Diagram.		
3-9	Horizontal Preamp Block Diagram.		
4-1	Location of Delayed Gate Out and Variable Selector multi-pin connectors.		

LIST OF ILLUSTRATIONS (cont)

Fig. No.		Fig. No.	
8-15	Partial A6—Sweep circuit board component locator (SN B090000 and up).	8-21	Partial A6—Sweep circuit board component locator (SN B089999 and below).
8-16	Partial A6—Sweep circuit board component locator (SN B089999 and below).	8-22	Partial A6—Sweep circuit board component locator (SN B090000 and up).
8-17	Partial A1—Interface circuit board (7B53A only) component locator.	8-23	Location of adjustments in the 7B53A/7B53AN (SN B209999 and below).
8-18	Partial A1—Interface circuit board (7B53AN only) component locator.	8-24	Location of adjustments in the 7B53A (SN B210000 and up).
8-19	A8—Readout circuit board (7B53A only) component locator.	8-25	Location of adjustments in the 7B53A/7B53AN.
8-20	Partial A6—Sweep circuit board component locator (SN B090000 and up).		

LIST OF TABLES

Table No.		Page
1-1	Electrical	1-1
1-2	Environmental	1-6
1-3	Physical	1-6
2-1	Deflection Factor of the X Signal	2-13
2-2	Risetime Measurements	2-16
4-1	Test Equipment	4-3
4-2	Main Sweep Timing	4-13
4-3	Delayed Sweep Timing	4-14
4-4	Main Sweep Magnifier Accuracy	4-15
4-5	Delayed Sweep Magnifier Accuracy	4-15
5-1	Relative Susceptibility to Static Discharge Damage	5-2

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

IN THIS MANUAL

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

AS MARKED ON EQUIPMENT


CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.


SYMBOLS

IN THIS MANUAL


 Static-Sensitive Devices.

 This symbol indicates where applicable cautionary or other information is to be found.

AS MARKED ON EQUIPMENT

 DANGER--High voltage.

 Protective ground (earth) terminal.

 ATTENTION--refer to manual.

WARNINGS

POWER SOURCE

This product is intended to operate in a mainframe connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the mainframe power cord is essential for safe operation.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the mainframe power cord. To avoid electrical shock, plug the mainframe power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the mainframe power cord is essential for safe operation.

7B53A/7B53AN

DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating), can render an electric shock.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

DO NOT OPERATE PLUG-IN UNIT WITHOUT COVERS

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in unit via a plug-in extender.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary

DO NOT SERVICE ALONE

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

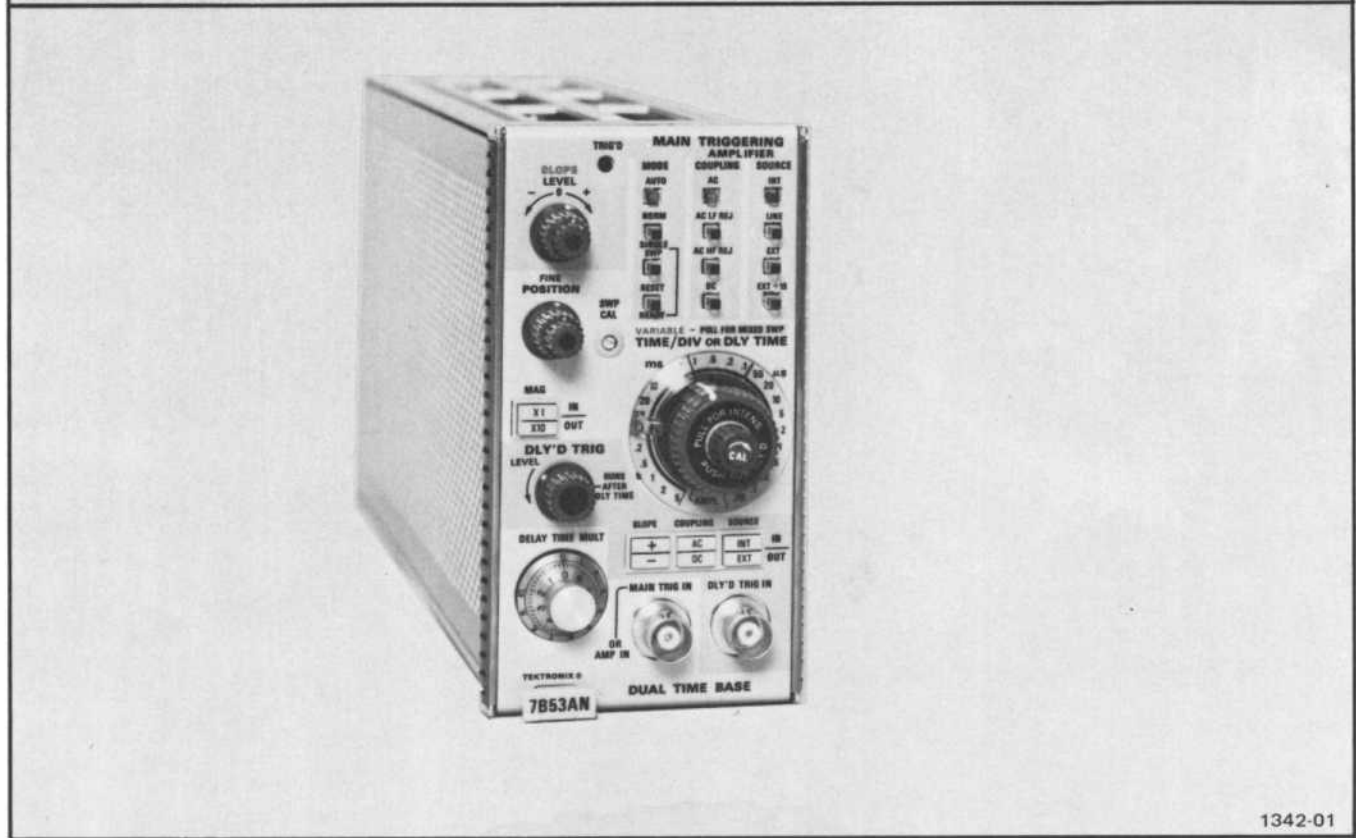
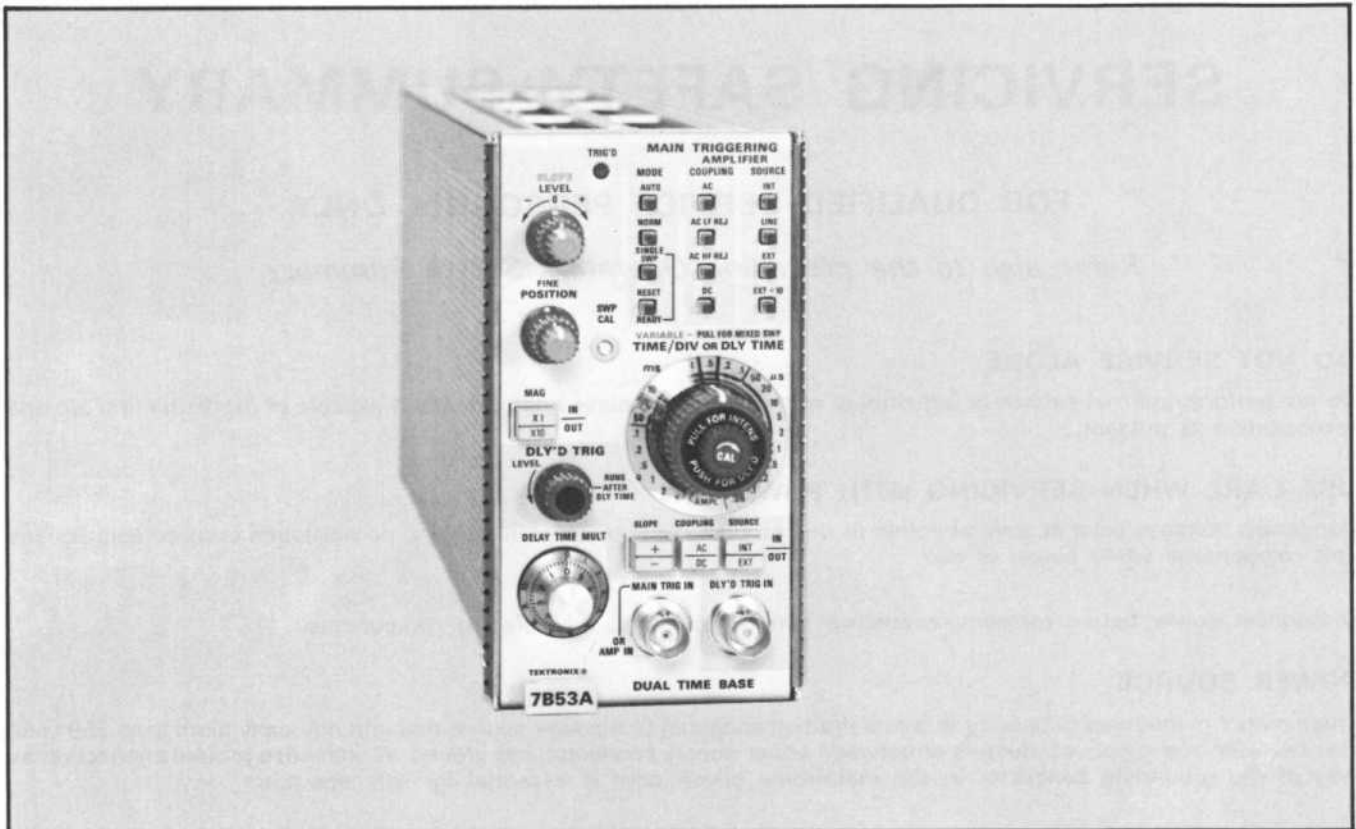
USE CARE WHEN SERVICING WITH POWER ON

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

POWER SOURCE

This product is intended to operate in a mainframe connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the mainframe power cord is essential for safe operation.



1342-01

The 7B53A/7B53AN Dual Time Base.

SPECIFICATION

NOTE

The 7B53A and 7B53AN are electrically identical except that only the 7B53A is compatible with the alphanumeric readout system provided for the 7000-series oscilloscopes.

This instrument will meet the electrical characteristics listed under Performance Requirement in Table 1-1, following complete calibration. The following electrical characteristics apply over an ambient temperature range of 0° C to +50° C, except as otherwise indicated. Warmup time for given accuracy is 20 minutes.

Table 1-1
ELECTRICAL

Characteristics	Performance Requirement				Supplemental Information
MAIN SWEEP					
Sweep Rates	0.05 μ s/div to 5 s/div in 25 calibrated steps.				
Sweep Accuracy	Measured in 7000-Series Oscilloscopes.				
Over Center Eight Divisions	+15° C to +35° C		0° C to +50° C		
	Unmag	Mag	Unmag	Mag	
50 ms/div to 0.5 μ s/div	Within 2%	Within 2.5%	Within 3%	Within 4%	
5 s/div to 0.1 s/div and 0.2 μ s/div to 0.05 μ s/div	Within 3%	Within 3.5%	Within 4%	Within 5%	
Over any 2 div portion within center eight div (all sweep rates)	Within 5%		Within 7%		
Variable Sweep Rates	Continuously variable between calibrated sweep rates. Extends sweep rate to at least 12.5 s/div.				Variable to at least 2.5:1. VARIABLE control internally switchable between variable main sweep rates, variable delayed sweep rates, and variable main sweep holdoff.
Sweep Hold-Off	Hold-off time may be varied at least 2:1 by front-panel VARIABLE control when Variable Selector connector (P140) is connected for variable holdoff.				

Table 1-1 (cont)

Characteristics	Performance Requirement				Supplemental Information
DELAYED SWEEP					
Sweep Rates	0.05 μ s/div to .5 s/div in 22 calibrated steps.				
Sweep Accuracy	Measured in 7000-Series Oscilloscopes.				
Over Center 8 Divisions	+15°C to +35°C		0°C to +50°C		
	Unmag	Mag	Unmag	Mag	
50 ms/div to 0.5 μ s/div	Within 3%	Within 3.5%	Within 4%	Within 5%	Exclude the first and beyond the 9th division of the unmagnified sweep when measuring magnified or unmagnified accuracy.
0.5 s/div to 0.1 s/div and 0.2 μ s/div to 0.05 μ s/div	Within 4%	Within 4.5%	Within 5%	Within 6%	
Over any 2 div portion within center eight div (all sweep rates)	Within 6%		Within 8%		
Variable Sweep Rate	Continuously variable between calibrated sweep rates.				Extends sweep rate to at least 1.25 s/div. Variable to at least 2.5:1. VARIABLE control switchable between variable main sweep rates, variable delayed sweep rates, and variable main sweep holdoff.
MIXED SWEEP, VARIABLE TIME DELAY					
Mixed Sweep Accuracy					
Main Sweep	Within 2% plus main sweep error.				Exclude the following portions of the mixed sweep:
Delayed Sweep	Unchanged.				First 0.5 div after start of main sweep display and 0.2 div or 0.1 μ s (whichever is greater) after transition of main to delayed sweep.
Variable Time Delay					
Delay Time Range	0 to 10 times DLY TIME/DIV settings from 5 s/div to 1 μ s/div.				Full scale is 10 times the TIME/DIV OR DLY TIME setting. Accuracy applies over the center eight major DELAY TIME MULT dial divisions.
Differential Delay Time Measurement Accuracy (+15°C to +35°C)					
5 s/div to 1 s/div	Within 1.4% of measurement plus 0.3% of full scale.				
0.5 s/div to 1 μ s/div	Within 0.7% of measurement plus 0.3% of full scale.				
Delay Time Jitter at 1 ms/div	Less than 1 part in 20,000 of 10X the TIME/DIV setting.				

Table 1-1 (cont)

Characteristics	Performance Requirement		Supplemental Information	
AMPLIFIER				
Deflection Factor				
EXT, MAG X10	10 mV/div within 10%.			
EXT, MAG X1	100 mV/div within 10%.			
EXT ÷ 10, MAG X1	1 v/div within 10%.			
Nominal Frequency Response	System -3 dB points in 7000-Series Oscilloscope.			
	Lower -3 dB	Upper -3 dB		
AC	40 Hz	2 MHz		
AC LF REJ	16 kHz	2 MHz		
AC HF REJ	40 Hz	100 kHz		
DC	DC	2 MHz		
MAIN TRIGGERING				
Trigger Sensitivity	Triggering Frequency Range	Minimum Trigger Signal Required		Triggering signal amplitude requirements increased 10 times for EXT ÷ 10 operation.
COUPLING		INT ^a (div)	EXT (mV)	
AC	30 Hz to 10 MHz	0.3	100	
	10 MHz to 100 MHz	1.5	500	
AC LF REJ	30 kHz to 10 MHz	0.3	—	
	150 kHz 10 MHz	—	100	
	10 MHz to 100 MHz	1.5	500	
AC HF REJ	30 Hz to 50 kHz	0.3	100	
DC	dc to 10 MHz	0.3	100	
	10 MHz to 100 MHz	1.5	500	

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
External Trigger Input Input R and C		Approximately 1 MΩ paralleled by 20 pF.
Maximum Safe Input Voltage		500 V (dc + Peak ac). 500 V peak-to-peak ac at 1 kHz or less.
Level Range EXT	At least + and - 1.5 V.	
EXT ÷ 10	At least + and - 15 V.	
Internal Trigger Jitter	1 ns or less at 75 MHz.	

DELAYED TRIGGERING

Trigger Sensitivity Coupling	Triggering Frequency Range	Minimum Trigger Signal Required	
		INT ^a (div)	EXT (mV)
AC	30 Hz to 10 MHz	0.3	100
	10 MHz to 100 MHz	1.5	500
DC	dc to 10 MHz	0.3	100
	10 MHz to 100 MHz	1.5	500
External Trigger Input Maximum Safe Input Voltage (DLY'D TRIG SOURCE set to EXT)		500 V (dc + peak ac). 500 V peak-to-peak ac at 1 kHz or less.	
Input R and C		1 MΩ paralleled by 20 pF.	
Level Range	At least + and - 1.5 V.		
Internal Trigger Jitter	1 ns or less at 75 MHz.		

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
OUTPUT SIGNALS		
Delayed Sweep Gate		
Maximum Safe Input Voltage		± 10 V (dc + Peak ac). 20 V peak-to-peak ac at 1 kHz or less.
Waveshape	Rectangular pulse.	
Amplitude	≥ 3.0 V with baseline at -0.2 to -1 V when loaded by at least 10 k Ω . ≥ 0.475 with baseline at 0 to -0.2 V when loaded by 50 Ω .	Available at front-panel DLY'D TRIG IN connector when operating in the INTEN, DLY'D SWP, or MIXED Display Modes. The DLY'D TRIG SOURCE switch must be set to INT and P613 must be connected for Delayed Sweep Gate Out.
Output Resistance		Approximately 350 Ω .
Loading		At least 10 k Ω shunted by 100 pF or less.
Polarity	Positive-going.	
Duration		
DISPLAY MODE		
INTEN, DLY'D SWP	For the time that the delayed sweep runs.	
MIXED	Composite gate signal with timing determined by the setting of the TIME/DIV OR DLY TIME switch during the main sweep portion of the display, and by the setting of the DLY'D Time/Division switch during the delayed sweep portion of the display.	
Sweep Gate		
Duration	Refer to associated oscilloscope manual.	
DISPLAY MODE		
MAIN SWEEP, INTEN	Coincident with the main sweep interval.	
DLY'D SWP	Coincident with the main sweep interval.	
MIXED	Coincident with the main sweep interval plus the delayed sweep interval.	
Main Sweep Gate		
Duration	Refer to associated oscilloscope manual. Coincident with the main sweep (all Display Modes).	

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
Sawtooth	Refer to associated oscilloscope manual.	
Waveshape		
DISPLAY MODE		
MAIN SWP, INTEN	Sawtooth signal with slope determined by setting of the TIME/DIV OR DLY TIME switch.	
DLY'D SWP	Sawtooth signal with slope determined by the setting of the DLY'D Time/ Division switch.	
MIXED	Composite sawtooth signal with slope determined by the setting of the TIME/DIV OR DLY TIME switch during the main sweep portion of display, and by the setting of the DLY'D Time/ Division switch during the delayed sweep portion of display.	
Duration	Coincident with the time that each sweep is displayed.	

^a For Internal Triggering only, the specified -3 dB frequency of the vertical system replaces any frequencies in the above table when the number in the table is greater than the -3 dB frequency of the vertical system.

Table 1-2

ENVIRONMENTAL

Refer to the Specification for the associated oscilloscope.

Table 1-3

PHYSICAL

Characteristics	Description
Size	Fits all 7000-series plug-in compartments.
Weight	3.3 lbs (1.5 kg).

OPERATING INSTRUCTIONS

7B53A/7B53AN Features

The 7B53A and 7B53AN Dual Time Base units provide Main, Intensified, Delayed, and Mixed sweep operation for TEKTRONIX 7000-Series Oscilloscopes. Calibrated sweep rates from 5 s/div to 50 ns/div (5 ns with X10 magnification) and triggering to 100 MHz are provided. The 7B53A and 7B53AN are electrically identical except that only the 7B53A is compatible with the alphanumeric readout system provided for 7000-Series Oscilloscopes.

Other features include 0 to 10 times continuous sweep delay, variable main and delayed sweep rates, and variable main sweep holdoff. Separate triggering controls are provided for main and delayed sweep triggering, and when operating in the AUTO MAIN TRIGGERING MODE, a bright base line is displayed in the absence of a trigger signal. The 7B53A/7B53AN can also be used as an amplifier for X-Y operation.

General

The 7B53A/7B53AN operates with a TEKTRONIX 7000-Series Oscilloscope and a 7A-Series Amplifier unit to form a complete oscilloscope system. To effectively use the 7B53A/7B53AN, its operation and capabilities should be known. This section explains the operation of the front-panel controls and connectors, provides an Operating Checkout procedure, gives general operating information, and describes basic applications for this instrument.

Installation

The 7B53A/7B53AN is designed to operate in the horizontal compartment of the indicator oscilloscope. This instrument can also be installed in the Vertical plug-in compartment to provide a sweep that runs vertically on the crt. However, when used in this manner, there are no retrace blanking or internal triggering provisions, and the unit may not meet the specifications given in Section 1. The instructions in this manual are written for use of the 7B53A/7B53AN in the horizontal plug-in compartment.

Before proceeding with installation it is necessary to check the internal connections of the Variable Selector connector and the Delayed Sweep Gate Out connector. These connections should be checked against those shown in Fig. 4-1 by qualified service personnel.

To install the 7B53A/7B53AN in a plug-in compartment, push it in until it fits firmly into the compartment. The front panel of the 7B53A/7B53AN should be flush with the front panel of the indicator oscilloscope. Even though the gain of the indicator oscilloscope is standardized to minimize adjustment when inserting plug-in units, the sweep calibration of the 7B53A/7B53AN should be checked when installed. The procedure for checking the unit is given under Sweep Calibration in the Operating Checkout procedure in this section.

To remove the 7B53A/7B53AN, pull the release latch (see Fig. 2-1) to disengage the unit from the indicator oscilloscope and pull it out of the plug-in compartment.

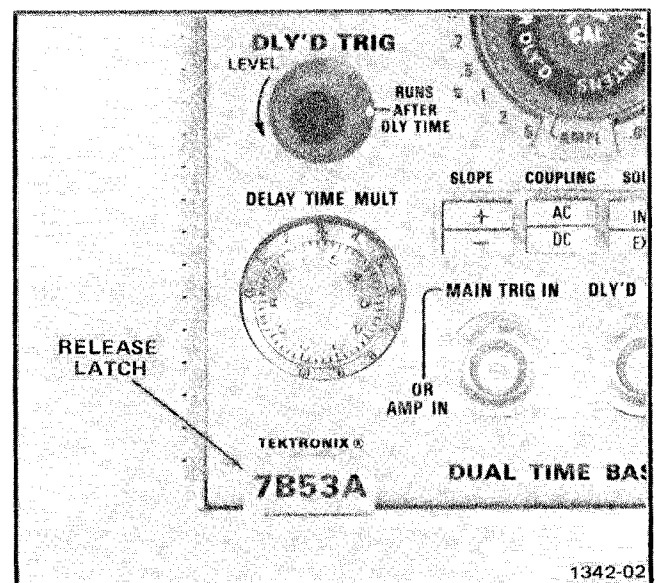


Fig. 2-1. Location of release latch.

CONTROLS AND CONNECTORS

General

All controls required for the operation of the 7B53A/7B53AN, except the Variable Selector and the Dly'd Sweep Gate Out connector are located on the front panel of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each control. A brief description of the front-panel controls and connectors is given here. More detailed information is given under

Operating Instructions—7B53A/7B53AN

General Operating Information. Fig. 2-2 shows the front panel and external controls and connectors of the 7B53A/7B53AN.

1. Main Triggering Controls

LEVEL. Selects the amplitude point on the trigger signal where sweep triggering occurs.

SLOPE. Two-position switch permits triggering on the positive-going or negative-going portion of the main triggering signal.

TRIG'D. Light indicates that the main sweep is triggered and will produce a display.

MODE. Pushbutton switches select the operating mode for the main triggering circuits.

COUPLING. Pushbutton switches select the method of coupling the triggering signal to the main triggering circuits.

SOURCE. Pushbutton switches select the source of the main triggering signal.

2. Sweep Controls

TIME/DIV OR DLY TIME. Selects the sweep rate of the main sweep generator (see Fig. 2-5).

DLY'D Time/Division. Selects the sweep rate of the delayed sweep generator and selects the MAIN SWP, INTEN, and DLY'D SWP Display Modes (see Fig. 2-5).

VARIABLE. Provides continuously variable main sweep rates, continuously variable delayed sweep rates,

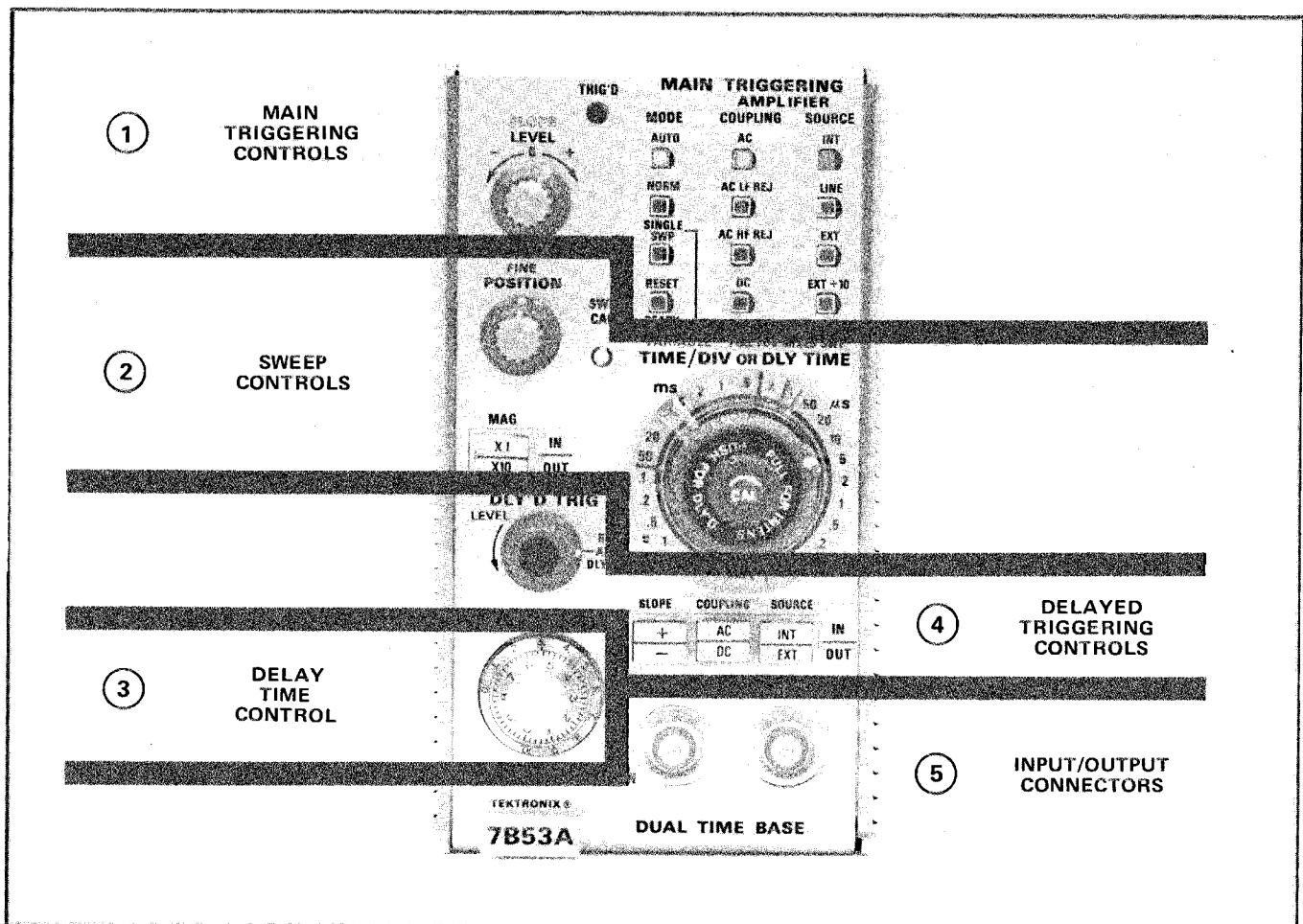


Fig. 2-2. Front-panel controls and connectors.

or variable main sweep holdoff; depending on the setting of the Variable Selector multi-pin connector (P140). The VARIABLE control also selects the MIXED Display Mode (see Fig. 2-5).

SWP CAL. Screwdriver adjustment to match the gain of the 7B53A/7B53AN to the indicator oscilloscope for calibrated sweep rates.

POSITION. Controls horizontal position of display.

FINE. Provides precise control of horizontal position adjustment.

MAG. Pushbutton switch selects X1 or X10 horizontal magnification.

3. Delay Time Control

DELAY TIME MULT. Provides variable sweep delay between 0.00 and 10.0 times the delay time indicated by the TIME/DIV OR DLY TIME switch.

4. Delayed Triggering Controls

LEVEL. Selects the RUNS AFTER DLY TIME or Triggerable After Dly Time Modes, and the amplitude point at which the delayed sweep is triggered.

SLOPE. Two-position switch permits triggering on the positive-going or negative-going portion of the delayed triggering signal.

COUPLING. Two-position switch selects the method of coupling the triggering signal to the delayed triggering circuits.

SOURCE. Two-position switch to select the source of the delayed triggering signal.

5. Input/Output Connectors

MAIN TRIG IN OR AMP IN. Front-panel bnc connector serving as an external trigger input for the main triggering circuit or as an external horizontal input, depending upon the setting of the TIME/DIV OR DLY TIME switch and the MAIN TRIGGERING SOURCE switch.

DLY'D TRIG IN. Front-panel bnc connector serving as an external trigger input for the delayed triggering circuits or as a delayed sweep gate output; depending upon the DLY'D TRIG SOURCE switch, the position of P613, and the DISPLAY MODE.

OPERATING CHECKOUT

Introduction

The following procedure checks the basic operation of the 7B53A/7B53AN. It may also be used for familiarization with this instrument or as an incoming inspection. This procedure is divided into two parts, Sweep Control Functions, and Main and Delayed Triggering Functions. A complete operating check of the 7B53A/7B53AN control functions can be made by performing both parts, or each part may be performed separately.

NOTE

For optimum performance, the 7B53A/7B53AN should be installed in an oscilloscope system with similar frequency and sweep rate capabilities.

Setup Procedure

1. Install the 7B53A/7B53AN in the right horizontal compartment of the indicator oscilloscope.
2. Install a Vertical Amplifier unit in the left vertical compartment.
3. Turn on the indicator oscilloscope and allow at least 20 minutes warmup.

4. Set the 7B53A/7B53AN controls as follows:

MAIN TRIGGERING

SLOPE	(+)
MODE	AUTO
COUPLING	AC
SOURCE	INT

DLY'D TRIG

LEVEL	RUNS AFTER DLY TIME (fully clockwise)
SLOPE	(+)
COUPLING	AC
SOURCE	INT

Sweep Controls

POSITION	Midrange
MAG	X1-IN
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	1 ms
VARIABLE	CAL (fully clockwise)
Variable Selector	Main Variable
DELAY TIME MULT	1.00

5. Set the indicator oscilloscope to display the plug-in units and adjust for a well defined display. See indicator

Operating Instructions—7B53A/7B53AN

oscilloscope and vertical unit instruction manuals for detailed operating instructions.

Sweep Control Functions

The following procedure checks the operation of the sweep controls and checks the Display Modes.

Normal Sweep

1. Perform steps 1 through 5 of the Setup Procedure.

NOTE

The Time/Division switch selects main sweep rates, delayed sweep rates, and Display Modes (MAIN SWP, INTEN, DLY'D SWP, and MIXED). Refer to Selecting Sweep Rates and Display Modes discussions in the General Operating Instructions for further information.

2. To select the MAIN SWP Display Mode, press in the DLY'D Time/Division knob, and set the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch to the same sweep rate (1 ms).

3. Connect the 1 kHz calibrator signal from the indicator oscilloscope to the vertical amplifier unit Input. Adjust the Calibrator and the vertical Volts/Division switch for four divisions of display.

4. Rotate the MAIN TRIGGERING LEVEL control for a stable MAIN SWP display (non-delayed). Rotate the DELAY TIME MULT dial and note that it has no effect on the display.

5. Rotate the POSITION control and note that it horizontally positions the trace. Rotate the FINE control and note that it provides precise horizontal positioning. Disconnect the calibrator signal.

Sweep Calibration

NOTE

For accurate sweep timing, apply a signal of known frequency or time period (time-mark signal, calibrator square wave, 60 Hz line etc.) to the associated vertical amplifier unit and adjust the TIME/DIV OR DLY TIME switch and the SWP CAL control to calibrate the signal to the oscilloscope graticule. Be sure that the sweep timing signal is accurate within 0.5%. The following sweep calibration procedure uses a TEKTRONIX Time-Mark Generator.

6. Connect a 1 ms time-mark signal from the Time-Mark Generator with a 50 Ω bnc coaxial cable with bnc connectors and 50 Ω bnc termination to the Input of the associated vertical unit. Adjust the vertical Volts/Div switch for about four divisions of display and rotate the MAIN TRIGGERING LEVEL control for a stable display. Check the crt display for one complete time-mark per division (position as necessary). If necessary, adjust the SWP CAL screwdriver adjustment for one complete time-mark per division over the center eight divisions of display. Disconnect the Time-Mark Generator.

Intensified, Delayed, and Mixed Sweep

7. Reconnect the oscilloscope Calibrator signal to the vertical unit and adjust for about four divisions of vertical display. Pull out the DLY'D Time/Division knob and rotate clockwise to .1 ms/div for the INTEN Display Mode (TIME/DIV OR DLY TIME switch remains at 1 ms/div). Note that a delaying sweep with an intensified portion (delayed sweep) is displayed on the crt (the oscilloscope Intensity may need to be varied to view the intensified display).

8. Rotate the DELAY TIME MULT dial and note that the amount of delay time before the intensified portion of display is controlled by the DELAY TIME MULT dial.

9. Rotate the VARIABLE control counterclockwise out of switch detent and note that the sweep rate indicated by the TIME/DIV OR DLY TIME switch can be varied to at least the sweep rate of the next adjacent position (2 ms/div). The internal Variable Selector connector must be set for variable main sweep rates. Return the VARIABLE control to the CAL position.

10. Press the DLY'D Time/Division switch to the inner position for the DLY'D SWP Display Mode. Note the magnified display with sweep rate determined by the DLY'D Time/Division switch. The oscilloscope Intensity may need to be increased to view the delayed sweep display.

11. Pull out the VARIABLE Time/Division knob for the MIXED Display Mode (MIXED Display Mode can be selected when operating in the DLY'D SWP Display Mode only). Note that the main sweep is displayed at a rate determined by the TIME/DIV OR DLY TIME switch followed by a delayed sweep display at the rate determined by the DLY'D Time/Division switch. Rotate the DELAY TIME MULT dial and note that the amount of display allocated to each sweep is determined by the DELAY TIME MULT dial.

Main and Delayed Sweep Triggering Functions

The following procedure checks the operation of the main and delayed triggering controls:

Partial Procedure. To begin the Operating Checkout with triggering, perform steps 1 through 5 of the Setup Procedure provided at the beginning of the Operating Checkout. Connect the 1 kHz calibrator signal from the indicator oscilloscope to the vertical unit Input and adjust for about four divisions of vertical display.

12. Set the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch to 1 ms and press in the DLY'D Time/Division switch and the Variable control. CHECK—that a stable display can be obtained with the COUPLING switch for MAIN TRIGGERING set to AC, AC HF REJ, and DC for both the positive and negative positions of the SLOPE switch (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable main sweep display). Remove all connections from the oscilloscope system.

13. Connect a 60 Hz signal (line voltage, etc.) with a 50 Ω cable or voltage probe to the vertical unit Input and adjust the Volts/Div switch for about four divisions of display. Set the MAIN TRIGGERING COUPLING switch to AC LF REJ and set the TIME/DIV OR DLY TIME switch to 10 ms. Rotate the MAIN TRIGGERING LEVEL control throughout its range and check that a stable display cannot be obtained (TRIG'D light off).

14. Change the MAIN TRIGGERING SOURCE switch to LINE and the COUPLING switch to AC. Check that a stable main sweep display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC HF REJ, and DC (MAIN TRIGGERING LEVEL control may be adjusted as necessary). Remove all connections from the oscilloscope system.

15. Connect the indicator oscilloscope Calibrator signal to the vertical unit Input connector and to the MAIN TRIG IN connector. Set the Calibrator for a 0.4 V, 1 kHz signal and adjust the vertical unit Volts/Div switch for about four divisions of display. Set the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch to 1 ms. Set the MAIN TRIGGERING SOURCE switch to EXT and check that a stable display can be obtained with the COUPLING switch for MAIN TRIGGERING set to AC, AC HF REJ, and DC, for both the positive and negative positions of the SLOPE switch (MAIN TRIGGERING LEVEL control may be adjusted as necessary for a stable display).

16. Change the MAIN TRIGGERING SOURCE switch to EXT \div 10. Set the oscilloscope Calibrator for 4 V at 1 kHz and adjust the vertical unit Volts/Div switch for

about 4 divisions of display. Check that a stable display can be obtained with the COUPLING switch for MAIN TRIGGERING set to AC, AC HF REJ, and DC, for both the positive and negative positions of the SLOPE switch (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable delaying sweep display). Remove the Calibrator signal from the MAIN TRIG IN connector.

17. Set the MAIN TRIGGERING COUPLING switch to AC and the SOURCE switch to INT. Adjust the MAIN TRIGGERING LEVEL control for a stable display. Set the MODE switch to NORM and check for a stable display. Change the MODE switch to AUTO and adjust the LEVEL control for a free-running display. Change the MODE switch to NORM and check for no display.

18. Adjust the MAIN TRIGGERING LEVEL control for a stable display. Change the MAIN TRIGGERING MODE switch to SINGLE SWP. Press the RESET button and check for one sweep. Remove the 1 kHz signal from the vertical unit and press the RESET button. CHECK for no display and that the READY light is on. Connect the 1 kHz signal to the vertical unit and check for one sweep as the signal is applied.

19. Set the MAIN TRIGGERING MODE switch to AUTO. With the TIME/DIV OR DLY TIME switch at 1 ms, pull out the DLY'D Time/Division switch and rotate to .2 ms (Intensified Display Mode). Rotate the MAIN TRIGGERING LEVEL control for a stable display (oscilloscope Intensity may need to be varied to view the intensified display). Rotate the DELAY TIME MULT dial and note that the intensified portion of display is continuously variable.

20. Rotate the DLY'D TRIG LEVEL control counterclockwise out of switch detent for a triggered delayed sweep. With the DLY'D TRIG SLOPE, COUPLING, and SOURCE switches set to (+), AC, and INT; rotate the DLY'D TRIG LEVEL control for a stable intensified portion of display. Rotate the DELAY TIME MULT dial and note that the intensified portion of display does not start at the completion of the delay time (determined by the settings of the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial), but waits for the next trigger pulse.

21. Press the DLY'D Time/Division switch in for the DLY'D SWP Display Mode. Rotate the DLY'D TRIG LEVEL control for a stable delayed sweep display (oscilloscope Intensity may need to be varied). Check that a stable delayed sweep display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both + and - positions of the SLOPE switch (DLY'D TRIG LEVEL control may be adjusted as necessary for a stable delayed sweep display).

22. Change the DLY'D TRIG SOURCE switch to EXT. Connect the indicator oscilloscope Calibrator signal to the DLY'D TRIG IN connector. Set the oscilloscope Calibrator for 0.4 V at 1 kHz and adjust the vertical Volts/Division switch for about 4 divisions of display. Check that a stable delayed sweep display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the + and - positions of the SLOPE switch (DLY'D TRIG LEVEL control may be adjusted as necessary for a stable delayed sweep display).

GENERAL OPERATING INSTRUCTIONS

Pushbutton Switch Logic

The MODE, COUPLING, and SOURCE pushbuttons of the MAIN TRIGGERING switches are arranged in a sequence that places the most-often used position at the top of each series of pushbuttons. With this arrangement, a stable display can usually be obtained by pressing the top pushbuttons: AUTO, AC, and INT. When an adequate trigger signal is applied, the unit is triggered as indicated by the illuminated TRIG'D light, with the correct settings of the LEVEL control and SLOPE switch. If the TRIG'D light is not on, the LEVEL control is at a setting outside the range of the trigger signal applied to this unit from the vertical unit, the trigger signal is inadequate, or its frequency is below the lower frequency limit of the AC COUPLING switch position. If the desired display is not obtained with these buttons pushed in, other selections must be made. Refer to the following discussions or the instruction manuals for the associated oscilloscope and vertical unit for more information.

Triggered Light

The TRIG'D light conveniently indicates the condition of the triggering circuits. If the MAIN TRIGGERING controls are correctly set and an adequate trigger signal is applied, the TRIG'D light is on. Under certain conditions, the TRIG'D light may be off, indicating that the sweep is not triggered. The cause could be a misadjusted LEVEL control, incorrectly set COUPLING or SOURCE switches, low trigger signal amplitude, or a triggering signal repetition rate outside the acceptable frequency range. This light can be used as a general indication of correct triggering. It is particularly useful when setting up the trigger circuits when a triggering signal is available without a display on the crt.

Main Trigger Mode

The pushbuttons located under the MODE title select the mode in which the main sweep is triggered.

AUTO. When the AUTO pushbutton is pressed, a triggered display is presented whenever an adequate trigger signal is applied and the LEVEL control and SLOPE

switch are correctly set. The TRIG'D light indicates when the display is triggered.

When the trigger repetition rate is below about 30 Hz, outside the frequency range selected by the COUPLING switch, or when the trigger signal is inadequate, the sweep free-runs at the sweep rate indicated by the TIME/DIV OR DLY TIME switch (TRIG'D light off). When an adequate trigger signal is again applied, the free-running condition ends and a triggered display is presented. The sweep also free-runs when the LEVEL control is at a setting outside the amplitude range of the trigger signal. This type of free-running display can be useful when it is desired to measure only the maximum peak-to-peak amplitude of a signal without observing the waveshape (such as in bandwidth measurements). When the display is of a much greater amplitude than can be displayed on the crt, the sweep will be triggered in all positions of the LEVEL control and will not free-run.

NORM. When the NORM pushbutton is pressed, a triggered display is presented with the correct setting of the LEVEL control and SLOPE switch whenever an adequate trigger signal is applied. The TRIG'D light indicates when the display is triggered.

The NORM trigger mode must be used to produce triggered displays with trigger repetition rates below about 30 Hz. When the LEVEL control is at a setting outside the amplitude range of the trigger signal, when the trigger repetition rate is outside the frequency range selected by the COUPLING switch, or when the trigger signal is inadequate, there is no trace (TRIG'D light is off).

SINGLE SWEEP, RESET-READY. When the signal to be displayed is not repetitive or varies in amplitude, waveshape, or repetition rate, a conventional repetitive type display may produce an unstable presentation. A stable display can often be obtained under these circumstances by using the SINGLE SWP feature of this unit. The SINGLE SWP MODE is also useful to photograph non-repetitive or unstable displays.

To obtain a single-sweep display of a repetitive signal, first obtain the best possible display in the NORM MODE. Then without changing the other MAIN TRIGGERING switches, press the SINGLE SWEEP pushbutton. When ready to view the single-sweep display, press the RESET-READY pushbutton. A single trace is presented each time the RESET-READY pushbutton is pressed (as long as the repetitive signal remains connected to the system and MAIN TRIGGERING switches are correctly set); further sweeps cannot be presented until the RESET-READY pushbutton is pressed again. If the display signal is a complex waveform composed of varying amplitude, successive single-sweep displays may not start at the

same point on the waveform. To avoid confusion due to the crt persistence, allow the display to disappear before pressing the RESET-READY pushbutton again. At fast sweep rates, it may be difficult to view the single-sweep display. The apparent trace intensity can be increased by reducing the ambient light level or using a viewing hood as recommended in the indicator oscilloscope instruction manual.

Non-repetitive, random signals can be displayed in the SINGLE SWP MODE by first obtaining the best possible display in the NORM MODE with a signal that is about the same amplitude and frequency as the random signal. Then without changing the other MAIN TRIGGERING controls, press the SINGLE SWP pushbutton. When ready for the random signal, press the RESET-READY pushbutton. The RESET-READY pushbutton remains illuminated to indicate that the unit has been reset and is ready to produce a sweep. The light goes out after the single sweep has been displayed. To prepare the unit for another single-sweep display, press the RESET-READY pushbutton.

When using the SINGLE SWP MODE to photograph waveforms, turn off the graticule illumination while the trace is being photographed. Then the graticule can be photographed later to produce a double-exposure picture showing complete information. Further information on photographic technique is given in the appropriate camera instruction manual.

Main Triggering Coupling

The MAIN TRIGGERING pushbuttons located below the COUPLING title select the method in which the trigger signal is connected to the trigger circuits. Each position permits selection or rejection of the frequency components of the trigger signal which trigger the sweep. Fig. 1-5 graphically illustrates the band of frequencies covered by each position of the COUPLING switch.

AC. In the AC position of the COUPLING switch, the DC component of the trigger signal is blocked. Signals with low-frequency components below about 30 Hz are attenuated. In general, AC COUPLING can be used for most applications. However, if the signal contains unwanted frequency components or if the sweep is to be triggered at a low repetition rate or DC level, one of the remaining COUPLING switch positions will provide a better display.

The triggering point in the AC position of the COUPLING switch depends upon the average voltage level of the trigger signal. If the trigger signal occurs randomly, the average voltage level will vary, causing the triggering point to vary also. This shift of the triggering point may make it impossible to maintain a stable display. In such cases, use DC COUPLING.

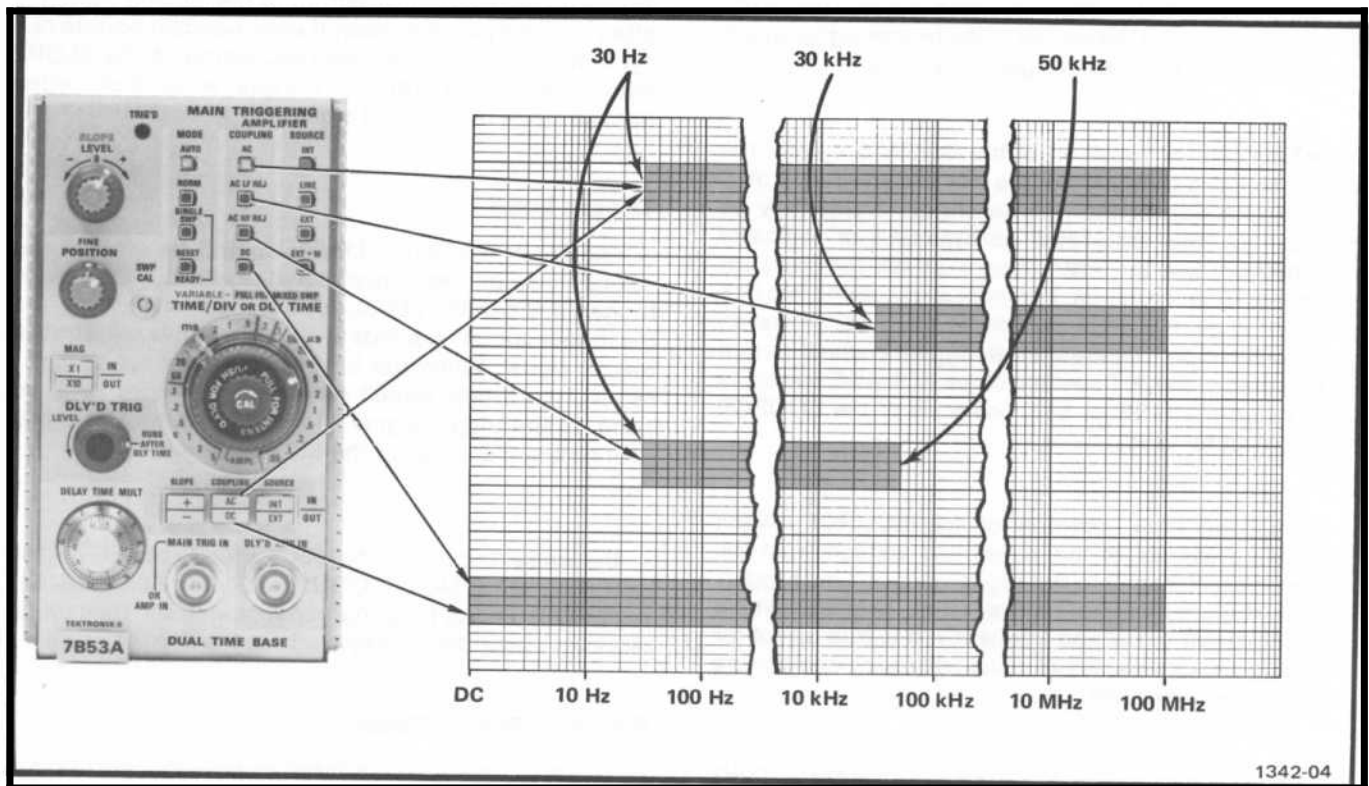


Fig. 2-3. Frequency range of each COUPLING switch position.

AC LF REJ. In the AC LF REJ position of the COUPLING switch, dc is rejected and low-frequency trigger signals below about 30 kHz are attenuated. Therefore, the sweep is triggered only by the higher-frequency components of the trigger signal. This position is particularly useful for providing stable triggering if the trigger signal contains line-frequency components. Also, the AC LF REJ position provides the best alternate vertical displays at fast sweep rates when comparing two or more unrelated signals.

AC HF REJ. The AC HF REJ position of the COUPLING switch passes all low-frequency signals between about 30 Hz and 50 kHz. Dc is rejected and signals outside the above range are attenuated. When triggering from complex waveforms, this position is useful to provide a stable display of the low-frequency components.

DC. The DC position of the COUPLING switch can be used to provide stable triggering with low-frequency signals which would be attenuated in the other modes, or with low-repetition rate signals. It can also be used to trigger the sweep when the trigger signal reaches a dc level selected by the setting of the LEVEL control. When using internal triggering, the setting of the vertical unit position control affects the dc triggering point.

Main Triggering Source

The MAIN TRIGGERING pushbutton located below the SOURCE title select the source of the trigger signal which is connected to the main triggering circuits.

INT. In the INT position of the SOURCE switch, the trigger signal is derived from the associated vertical unit. Further selection of the internal trigger signal may be provided by the associated vertical unit or indicator oscilloscope; see the instruction manuals for these instruments for information. For most applications, the INT position of the SOURCE switch can be used. However, some applications require special triggering which cannot be obtained in the INT position of the SOURCE switch. In such cases the LINE or EXT positions of the SOURCE switch must be used.

LINE. The LINE position of the SOURCE switch connects a sample of the power-line voltage from the indicator oscilloscope to the trigger circuit. Line triggering is useful when the input signal is time-related (multiple or submultiple) to the line frequency. It is also useful for providing a stable display of a line-frequency component in a complex waveform.

EXT. An external signal connected to the MAIN TRIG IN connector can be used to trigger the sweep in the EXT position of the SOURCE switch. The external signal must

be time-related to the displayed waveform for a stable display. An external trigger signal can provide a triggered display when the internal signal is too low in amplitude for correct triggering, or contains signal components on which it is not desired to trigger. It is also useful when signal tracing in amplifiers, phase shift networks, waveshaping circuits, etc. The signal from a single point in the circuit under test can be connected to the EXT TRIG IN connector with a probe or cable. The sweep is then triggered by the same signal at all times and allows amplitude, time relationship, or waveshape changes of signals at various points in the circuit to be examined without resetting the MAIN TRIGGERING controls.

EXT ÷ 10. Operation in the EXT ÷ 10 position of the SOURCE switch is the same as described for EXT except that the external signal is attenuated 10 times. Attenuation of high-amplitude external trigger signals is desirable to broaden the range of the LEVEL control.

Trigger Slope

The MAIN TRIGGERING SLOPE switch (concentric with the MAIN TRIGGERING LEVEL control) determines whether the trigger circuit responds on the positive-going or negative-going portion of the trigger signal. When the SLOPE switch is in the + position, the display starts on the positive-going portion of the waveform; in the - position, the display starts with the negative-going portion of the waveform (see Fig. 2-4). When several cycles of a signal appear in a display, the setting of the SLOPE switch is often unimportant. However, if only a certain portion of a cycle is to be displayed, correct setting of the SLOPE switch is important to provide a display which starts on the desired slope of the input signal.

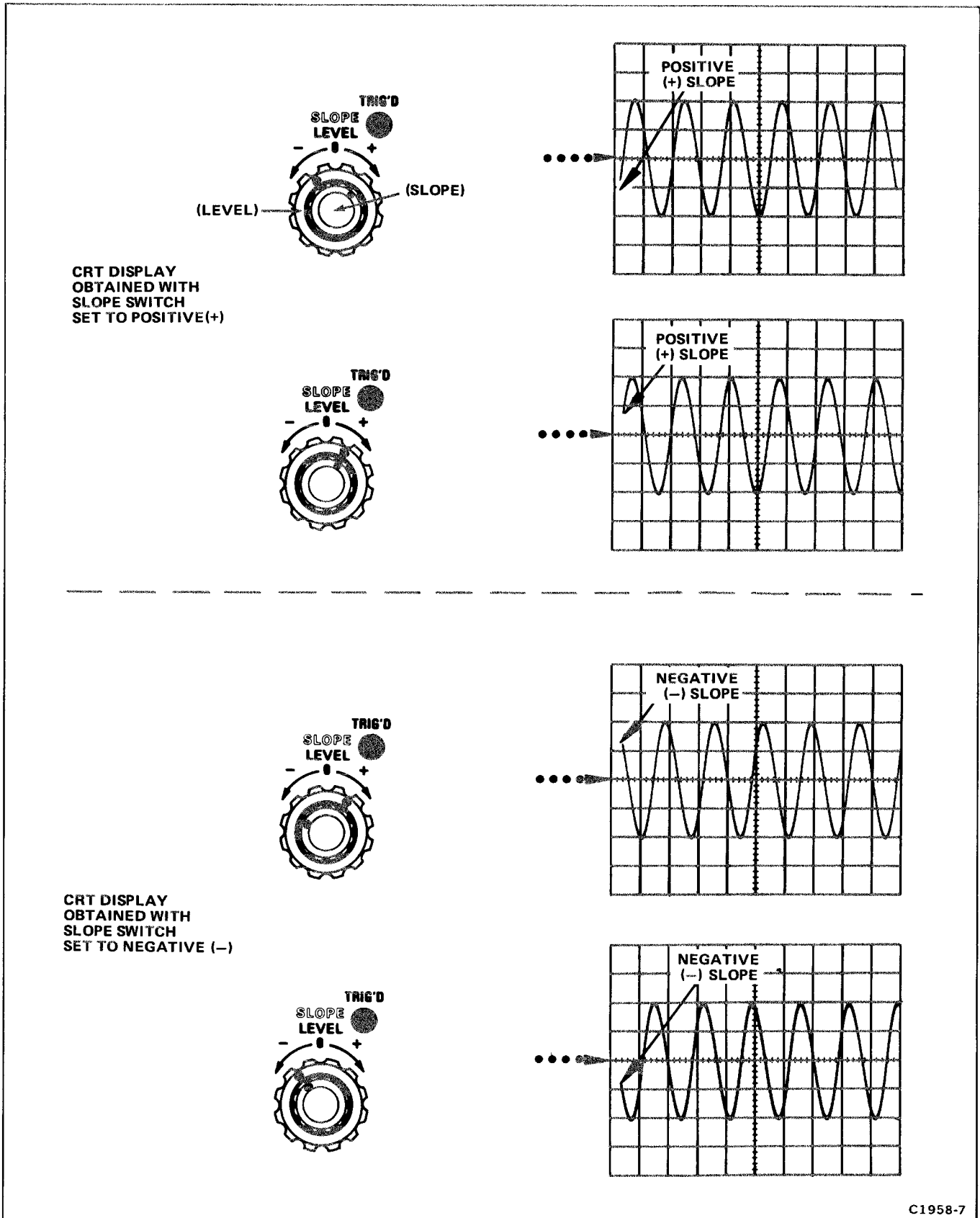
Trigger Level

The MAIN TRIGGER LEVEL control determines the voltage level on the trigger signal at which the sweep is triggered. When the LEVEL control is set in the + region, the trigger circuit responds at a more positive point on the trigger signal. When the LEVEL control is set in the - region, the trigger circuit responds at a more negative point on the trigger signal. Fig. 2-4 illustrates this effect with different settings of the SLOPE switch.

Before setting the MAIN TRIGGERING LEVEL, set the desired SLOPE, MODE, COUPLING, and SOURCE. Set the LEVEL control fully counterclockwise and then rotate clockwise until the display starts at the desired point.

Selecting Sweep Rates

The TIME/DIV OR DLY TIME switch selects calibrated sweep rates for the main sweep generator and the DLY'D Time/Division switch selects calibrated sweep rates for



C1958-7

Fig. 2-4. Effect of LEVEL control and SLOPE switch on CRT display.

the delayed sweep generator. The sweep rate of the main sweep generator is bracketed by the black lines on the clear plastic flange of the TIME/DIV OR DLY TIME switch (see Fig. 2-5). The sweep rate of the delayed sweep generator is indicated by the white line on the DLY'D Time/Division knob. When the TIME/DIV OR DLY TIME switch and the DLY'D Time/Division switch are set to the same sweep rate, the switches lock together and the sweep rate of both generators are changed at the same time. However, when the DLY'D Time/Division knob is pulled outward, the clear plastic flange is disengaged and only the delayed sweep generator sweep rate is changed. This allows changing the delayed sweep rate without changing the delay time determined by the main sweep generator. The DLY'D Time/Division switch also selects Display Modes. See Display Mode discussion in this section for further information.

A VARIABLE control is provided concentric with the TIME/DIV OR DLY TIME and the DLY'D Time/Division switches (see Fig. 2-5). When the VARIABLE control is rotated clockwise to the CAL position (into switch detent) the variable function is inoperative and the VARIABLE knob can be used only to select the MIXED Display Mode (see Display Mode discussion in this section for more information). However, when rotated counterclockwise (out of switch detent), the VARIABLE control is activated

for variable (uncalibrated) main sweep rates, delayed sweep rates, or main sweep holdoff; depending upon the setting of the Variable Selector multi-pin connector. The VARIABLE control allows the sweep rate in each Time/Division switch position (main or delayed) to be reduced to at least the next adjacent switch position and the holdoff time to be increased 2:1.

Time Measurement

When making time measurements from the graticule, the center eight divisions provide the most linear time measurements (see Fig. 2-6). Position the start of the timing area to the second vertical line and adjust the TIME/DIV OR DLY TIME switch so the end of the timing area falls between the second and tenth vertical lines.

Sweep Magnifier

The sweep magnifier can be used to expand the display ten times. The center division of the unmagnified display is the portion visible on the crt in the magnified form (see Fig. 2-7). Equivalent length of the magnified sweep is more than 100 divisions; any 10 division portion can be viewed by adjusting the POSITION control to bring the desired portion onto the viewing area.

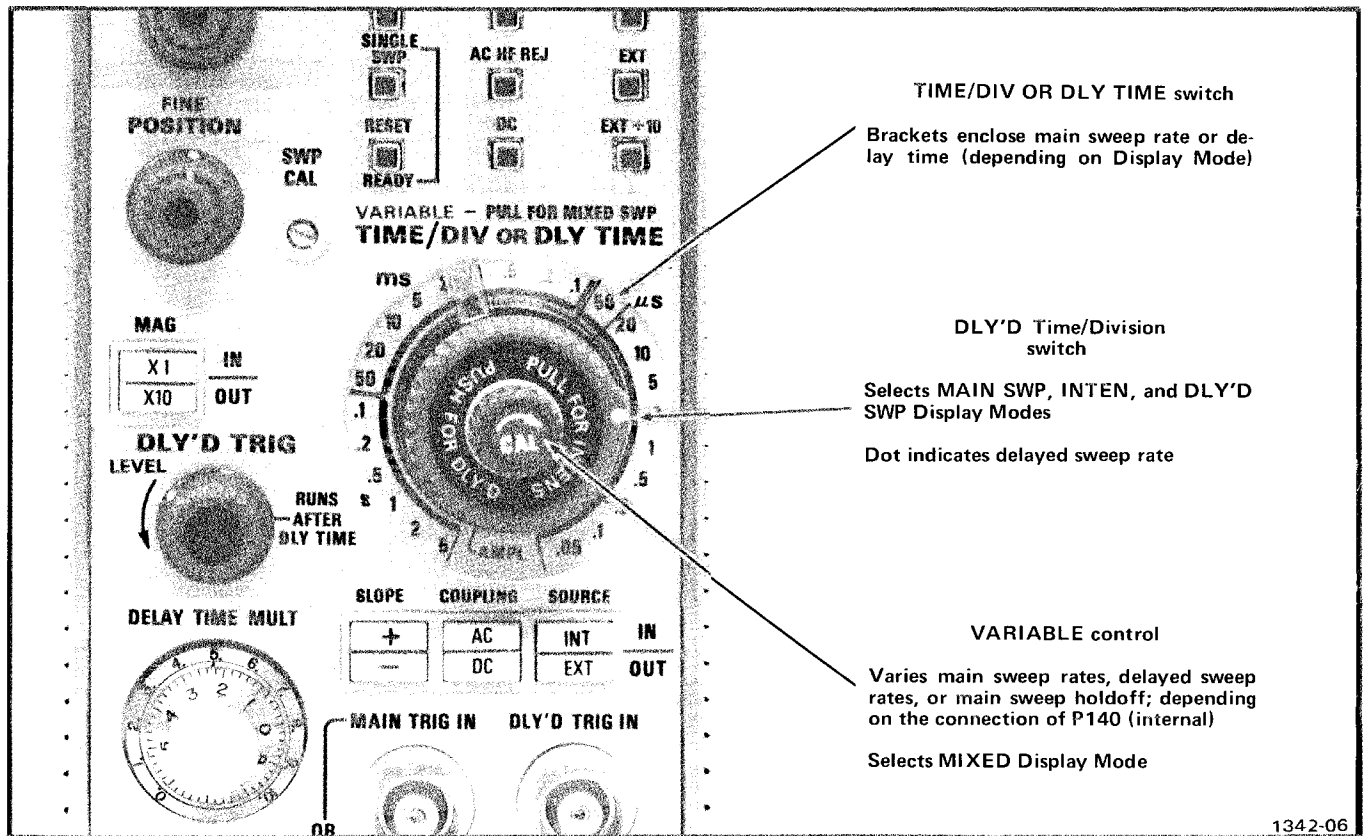


Fig. 2-5. Composite Time/Division switch.

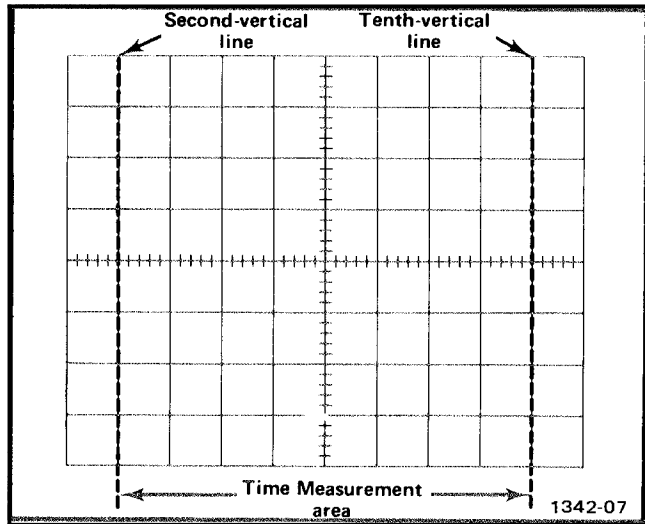


Fig. 2-6. Area of graticule used for accurate time measurements.

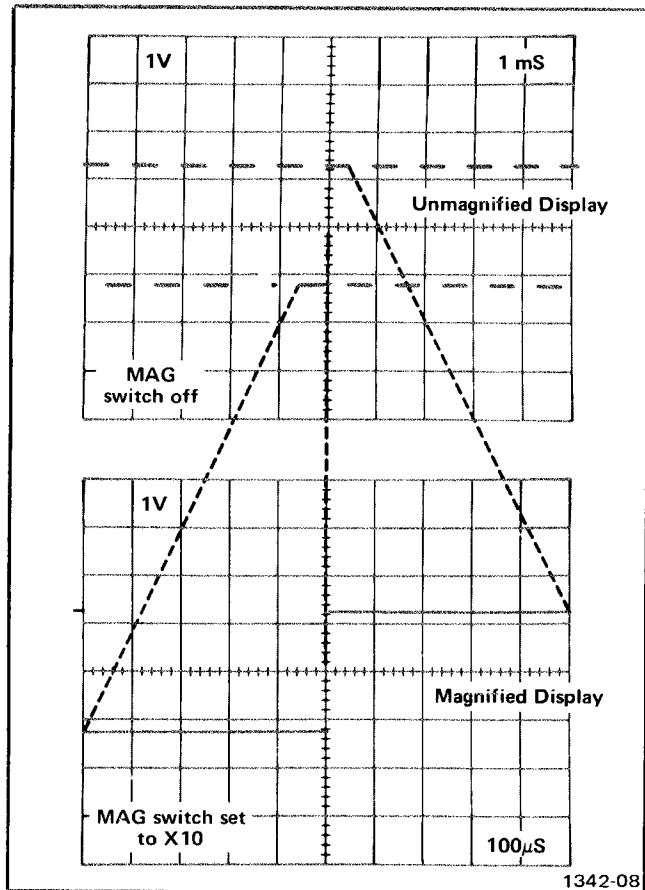


Fig. 2-7. Operation of Sweep Magnifier.

To use the MAG switch, first move the portion of the display which is to be expanded to the center of the graticule. Then press and release the MAG switch to the

OUT — X10 position. When the MAG switch is in the X10 position, the equivalent magnified sweep rate can be determined by dividing the Time/Division setting by 10. For example, if the TIME/DIV OR DLY TIME switch is set to 1 ms the equivalent sweep rate is 100 μ s. When operating in the INTEN, DLY'D SWP, or MIXED Display Modes the delayed sweep rate as well as the main sweep rate is increased 10 times.

Display Modes

Four Display Modes can be selected by appropriate settings of the Time/Division switches (see Fig. 2-5).

Main Sweep Operation. To select the MAIN SWP Display Mode (non-delayed sweep) set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to the same sweep rate and press in the DLY'D Time/Division switch. Calibrated sweep rates in the MAIN SWP Display Mode are available from 5 s/div to 0.05 μ s/div (5 ns/div with X10 magnification). The VARIABLE control (Variable Selector connector set to Main Variable) can be used to obtain uncalibrated sweep rates to 12.5 s/div. Triggering in the MAIN SWP Display Mode is controlled by the MAIN TRIGGER controls.

Intensified Sweep Display. To select the INTEN Display Mode, pull out the DLY'D Time/Division knob and rotate it to a desired sweep rate faster than the TIME/DIV OR DLY TIME switch setting. The INTEN Display Mode provides an intensified portion of the main sweep during the time the delayed sweep is in operation (see Fig. 2-8A). The time that the delayed sweep runs is determined by the DLY'D Time/Division switch. The amount of delay time between the start of the delaying sweep and the intensified portion is determined by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial. Triggering for the delaying sweep portion of display is controlled by the MAIN TRIGGERING controls; triggering for the intensified portion of display is controlled by the DLY'D TRIG controls.

Delayed Sweep Display. The DLY'D SWP Display Mode is selected when the DLY'D Time/Division switch is pulled out, rotated in the INTEN Mode for the desired sweep rate, and then pushed in. In this mode, the intensified portion of display, as viewed in the INTEN Display Mode, is displayed on the crt at the sweep rate indicated by the DLY'D Time/Division switch (see Fig. 2-8B). Calibrated sweep rates in the DLY'D SWP Display Mode are available from .5 s/div to 0.05 μ s/div. Uncalibrated delayed sweep rates to 1.25 s/div can be obtained by using the VARIABLE control (Variable Selector connector set to Dly'd Variable position). Triggering for the DLY'D SWP display is controlled by the DLY'D TRIG controls.

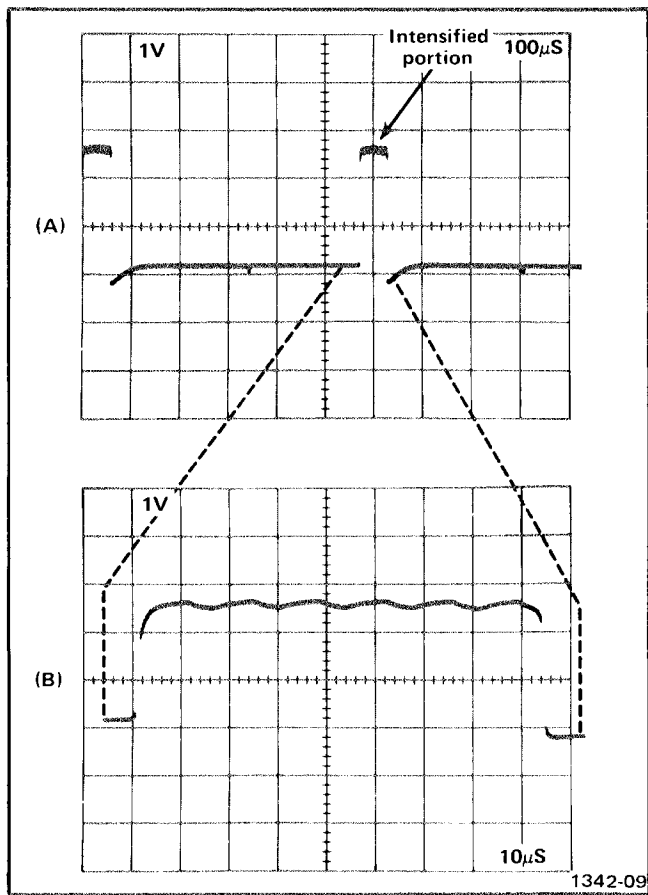


Fig. 2-8. (A) Intensified Sweep display; (B) Delayed Sweep display.

Mixed Sweep Operation. The MIXED Display Mode is selected when the DLY'D SWP Display Mode is selected and the VARIABLE knob is pulled out. In this mode, the main sweep is displayed on the crt to a point determined by the DELAY TIME MULT dial; the remainder of the sweep is at a rate determined by the delayed sweep. Triggering for the main sweep portion of display is controlled by the MAIN TRIGGERING controls; and triggering for the delayed sweep portion of display is controlled by the DLY'D TRIG controls. A typical mixed sweep display is shown in Fig. 2-9.

Delay Time Multiplier

The DELAY TIME MULT dial (functional in the INTEN, DLY'D SWP, and MIXED Display Modes) provides 0 to 10 times continuous sweep delay. The time that the main sweep runs before the start of the delayed sweep is determined by the settings of the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial.

For example, the delay time indicated by the DELAY TIME MULT dial in Fig. 2-10 is 3.55; this corresponds to 3.55 crt divisions of main sweep. Thus 3.55 multiplied by

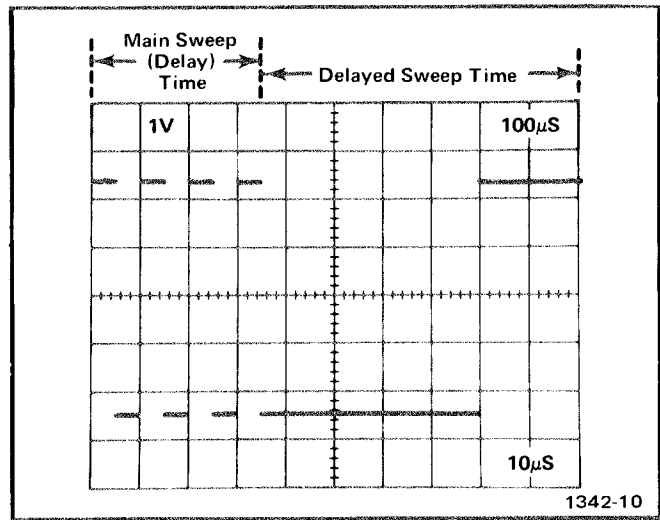


Fig. 2-9. Typical Mixed Sweep display (DELAY TIME MULT dial set to 3.55)

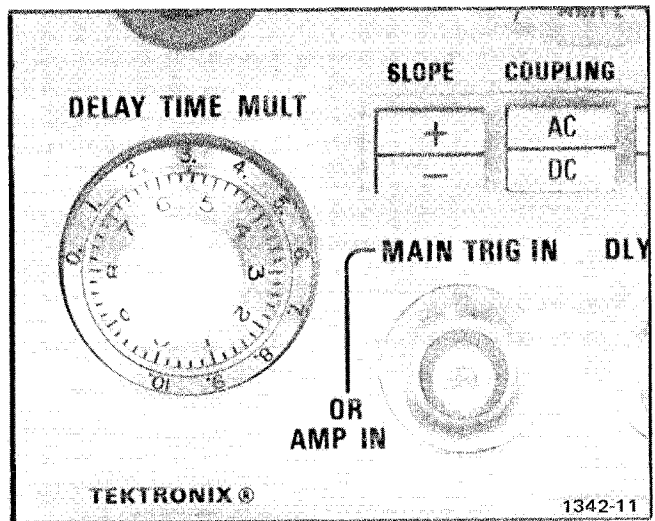


Fig. 2-10. DELAY TIME MULT dial. Reading shown: 3.55.

the delaying sweep rate, indicated by the TIME/DIV OR DLY TIME switch, gives the calibrated delay time before the start of the delayed sweep.

Delayed Sweep Triggering

A LEVEL control and SLOPE, COUPLING, and SOURCE switches are provided for delay sweep triggering. When the LEVEL control is rotated to the RUNS AFTER DLY TIME position the delayed sweep starts immediately after the delay time. The DLY'D TRIG LEVEL control and the SLOPE, COUPLING, and SOURCE switches are inoperative. This mode permits the selection of continuously variable delay times (by varying the DELAY TIME MULT dial).

When the DLY'D TRIG LEVEL control is rotated counterclockwise (out of switch detent), the delayed sweep is triggerable. The delayed sweep does not start at the completion of the delay time but, waits until a trigger pulse is received by the delayed sweep triggering circuit. The delay time in this mode is dependent not only on the settings of the delay-time controls, but on the delayed sweep triggering controls and the occurrence of the delayed sweep triggering signal. The primary purpose of this mode is to eliminate jitter from the display delayed sweep waveform. Since the delayed sweep is triggered by the input waveform, jitter is eliminated from the delayed sweep display even though it may be inherent in the input waveform.

When the delayed sweep is triggerable, the LEVEL control can be rotated to select the amplitude point on the trigger signal at which the delayed sweep is triggered. The DLY'D TRIG SLOPE, COUPLING, and SOURCE switches are activated and their functions are the same for delayed triggering as functions with the same title are for MAIN TRIGGERING (see Main Triggering Level, Slope, Coupling, and Source discussions in this section).

Input/Output Connectors

Two dual-function bnc connectors are provided on the instrument front-panel.

MAIN TRIG IN OR AMP IN. This connector is an external trigger input for the main triggering circuit when the MAIN TRIGGERING SOURCE switch is set to EXT or EXT \div 10 and the TIME/DIV OR DLY TIME switch is set to any position except AMPL. When the TIME/DIV OR DLY TIME switch is set to AMPL and the MAIN TRIGGERING SOURCE switch is set to EXT or EXT \div 10, this connector serves as an external horizontal input (see X-Y Operation).

DLY'D TRIG IN. This connector is an external input for the delayed triggering circuit when the DLY'D TRIG SOURCE switch is set to EXT. When the DLY'D TRIG SOURCE switch is set to INT and P613 is properly connected, the DLY'D TRIG IN connector serves as a Delayed Sweep Gate Out connector (not labeled). The Delayed Sweep Gate signal is a rectangular positive-going pulse with approximately 3.0 V amplitude and pulse width coincident with the delayed sweep.

X-Y Operation

Some applications required one signal displayed versus another rather than against time (internal sweep). The amplifier function of the 7B53A/7B53AN allows an external signal to be applied to the horizontal deflection system either externally via the MAIN TRIG IN OR AMP IN connector or internally by way of the triggering system.

To apply an external signal (X-signal) to the horizontal system, set the 7B53A/7B53AN TIME/DIV OR DLY TIME switch to AMPL and the MAIN TRIGGERING SOURCE switch to EXT. The MAIN TRIGGERING COUPLING selected affects the frequency response of the X-signal. Apply the external signal to the MAIN TRIG IN OR AMP IN connector. Deflection factor of the X-signal is provided in multiples of 10 as shown in Table 2-1. The Y-signal can be applied to the plug-in unit installed in the vertical compartment.

Table 2-1

DEFLECTION FACTOR OF THE X SIGNAL

Main Triggering Coupling	Mag	Deflection Factor (within 10%)
EXT	X10	10 mV/div
EXT	X1	100 mV/div
EXT \div 10	X1	1 V/div

To apply the X-signal internally via the triggering system set the TIME/DIV OR DLY TIME switch to AMPL and the MAIN TRIGGERING SOURCE switch to INT. Apply the external signal to the Amplifier unit installed in the vertical compartment. The attenuator switch of the Amplifier unit determines the horizontal deflection factor.

For information on X-Y applications see the oscilloscope manual. Also, the reference books listed under Applications provide information on X-Y measurements and interpreting the resultant lissajous displays.

Mainframe Operating Modes

The 7B53A/7B53AN can be operated in a 7000-Series Oscilloscope which has four plug-in compartments, either independently, in the Alternate or Chopped Horizontal Modes, or as a delayed sweep unit. However, when the 7B53A/7B53AN is operated as a delayed sweep unit, it must be triggered for a crt display. It cannot delay another time base unit but it can delay its own internal delayed sweep. Refer to the appropriate oscilloscope manual for additional mainframe horizontal operating information.

APPLICATIONS

General

The following information describes the procedure and techniques for making basic measurements with a 7B53A/7B53AN installed in a 7000-Series Oscilloscope. These applications are not described in detail, since each application must be adapted to the requirements of the

Operating Instructions—7B53A/7B53AN

individual measurement. This instrument can also be used for many applications not described in this manual. Contact your local Tektronix Field Office or representative for assistance in making specific measurements. The following books describe oscilloscope measurement techniques which can be adapted for use with this instrument.

J. Czech, "Oscilloscope Measuring Techniques", Phillips Technical Library, Springer-Verlag, New York, 1965.

John D. Lenk, "Handbook of Oscilloscope Theory and Applications", Prentice-Hall, Inc. Englewood Cliffs, N.J., 1968.

Charles H. Roth, Jr., "Use of the Oscilloscope", Programmed Text, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1970.

J.H. Golding, "Measuring Oscilloscope", Transatlantic, 1971.

Comparison Measurement Techniques

Sweep Rates. To establish an arbitrary horizontal sweep rate based upon a specific reference frequency proceed as follows:

1. Connect the reference signal to the input of the vertical unit. Set the Volts/Division switch of the vertical unit for four or five divisions of vertical deflection. Obtain a triggered display.

2. Set the TIME/DIV OR DLY TIME switch and the VARIABLE control (Variable Selector connector set to Main Variable) so one cycle of the signal covers an exact number of horizontal divisions. Do not change the VARIABLE control after obtaining the desired deflection. This display can be used as a reference for frequency comparison measurements.

3. To establish an arbitrary sweep rate so the period (time for one complete cycle) of an unknown signal can be measured accurately at any setting of the TIME/DIV OR DLY TIME switch, the period of the reference signal must be known. If it is not known, it can be measured before the VARIABLE switch is set in step 2.

4. Divide the period of the reference signal (seconds) by the product of the horizontal deflection established in step 2 (division) and the setting of the TIME/DIV OR DLY TIME switch. This is the horizontal conversion factor:

$$\text{Horizontal Conversion Factor} = \frac{\text{reference signal period (seconds)}}{\text{horizontal deflection (divisions)} \times \text{TIME/DIV OR DLY TIME switch setting}}$$

5. To measure the period of an unknown signal disconnect the reference signal and connect the unknown signal to the vertical unit. Set the TIME/DIV OR DLY TIME switch to a setting that provides sufficient horizontal deflection to make an accurate measurement. Do not readjust the VARIABLE control.

6. Measure the horizontal deflection in divisions and calculate the period of the unknown signal using the following formula:

$$\text{Period (Seconds)} = \frac{\text{TIME/DIV OR DLY TIME setting} \times \text{horizontal conversion factor} \times \text{horizontal deflection (divisions)}}{1}$$

Example. Assume a reference signal frequency of 455 Hz (period 2.19 ms), a TIME/DIV OR DLY TIME switch setting of .2 ms, and the VARIABLE control adjusted to provide a horizontal deflection of eight divisions. Substituting these values in the horizontal conversion factor formula (step 4):

$$\text{Horizontal Conversion Factor} = \frac{2.19 \text{ ms}}{.2 \text{ ms} \times 8} = 1.37$$

Then, with a TIME/DIV OR DLY TIME switch setting of 50 μ s, the period of an unknown signal which completes one cycle in seven horizontal divisions can be determined by using the period formula (step 6):

$$\text{Period (Seconds)} = 50 \mu\text{s} \times 1.37 \times 7 = 480 \mu\text{s}$$

This answer can be converted to frequency by taking the reciprocal of the period in seconds (see application on Determining Frequency Measurements).

Time Duration Measurements

To measure time between two points on a waveform, use the following procedure:

1. Connect the signal to be displayed to the input of the vertical unit.

2. Set the Vertical and Horizontal Mode switches on the indicator oscilloscope to display the plug-in units used.

3. Set the Volts/Division switch of the vertical unit to display about four divisions of waveform.

4. Set the MAIN TRIGGERING controls to obtain a stable display.

5. Set the TIME/DIV OR DLY TIME switch to the fastest sweep rate that displays less than eight divisions between the time measurement points (see topic entitled "Time Measurements" and Fig. 2-6).

6. Adjust the vertical unit position control to move the points between which the time measurement is made to the center horizontal line.

7. Adjust the horizontal POSITION control to position the time-measurement points within the center eight divisions of the graticule.

8. Measure the horizontal distance between the time measurement points. Be sure the VARIABLE control is set to CAL.

9. Multiply the distance measured in step 8 by the setting of the TIME/DIV OR DLY TIME switch.

Example. Assume that the distance between the time measurement points is five divisions (see Fig. 2-11), and the TIME/DIV OR DLY TIME switch is set to .1 ms.

Using the formula:

$$\text{Time Duration} = \frac{\text{horizontal distance (divisions)}}{\text{TIME/DIV OR DLY TIME setting}} \times$$

Substituting the given values:

$$\text{Time Duration} = 5 \times 0.1 \text{ ms}$$

The time duration is 0.5 ms.

Determining Frequency

The time measurement technique can also be used to determine the frequency of a signal. The frequency of a periodically recurrent signal is the reciprocal of the time duration (period) of one complete cycle.

Use the following procedure:

1. Measure the time duration of one complete cycle of the waveform as described in the previous application.

2. Take the reciprocal of the time duration to determine the frequency.

Example. The frequency of the signal shown in Fig. 2-11 which has a time period of 0.5 ms is:

Frequency =

$$\frac{1}{\text{time period}} \times \frac{1}{0.5 \text{ ms}} = 2 \text{ kHz}$$

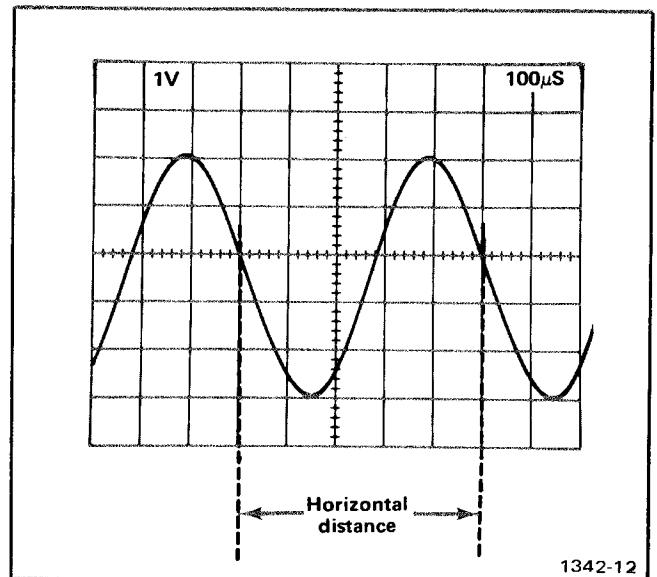


Fig. 2-11. Measuring the time duration between points on a waveform.

Risetime Measurements

Risetime measurements employ basically the same techniques as time-duration measurements. The main difference is the points between which the measurement is made. The following procedure gives the basic method of measuring risetime between the 10% and 90% points of the waveform. Falltime can be measured in the same manner on the trailing edge of the waveform.

Operating Instructions—7B53A/7B53AN

1. Connect the signal to be displayed to the input of the vertical unit.

2. Set the Vertical and Horizontal Mode switches on the indicator oscilloscope to display the plug-in unit used.

3. Set the Volts/Division switch and the Variable Volts/Division control of the vertical unit to produce a signal an exact number of divisions in amplitude.

4. Center the display about the center horizontal graticule line with the vertical unit Position control.

5. Set the MAIN TRIGGERING controls to obtain a stable display.

6. Set the TIME/DIV OR DLY TIME switch to the fastest sweep rate that displays less than eight divisions between the 10% and 90% points on the waveform.

7. Determine the 10% and 90% points on the rising portion of the waveform. The figures given in Table 2-2 are for the points 10% up from the start of the rising portion and 10% down from the top of the rising portion (90% point).

Table 2-2

RISETIME MEASUREMENTS

Vertical display (divisions)	10% and 90% points	Divisions Vertically between 10% and 90% points
4	0.4 and 3.6 divisions	3.2
5	0.5 and 4.5 divisions	4.0
6	0.6 and 5.4 divisions	4.8
7	0.7 and 6.3 divisions	5.6
8	0.8 and 7.2 divisions	6.4

8. Adjust the horizontal POSITION control to move the 10% point of the waveform to the second vertical line of the graticule. For example, with a five-division display as shown in Fig. 2-12, the 10% point is 0.5 division up from the start of the rising portion.

9. Measure the horizontal distance between the 10% and 90% points. Be sure the VARIABLE control is set to CAL.

10. Multiply the distance measured in step 9 by the setting of the TIME/DIV OR DLY TIME switch.

Example. Assume that the horizontal distance between the 10% and 90% points is four divisions (see Fig. 2-12) and the TIME/DIV OR DLY TIME switch is set to 1 μ s. Applying the time duration formula to risetime:

$$\text{Time Duration (Risetime)} = \text{horizontal distance (divisions)} \times \text{TIME/DIV OR DLY TIME setting}$$

Substitute the given values:

$$\text{Risetime} = 4 \times 1 \mu\text{s}.$$

The risetime is 4.0 μ s.

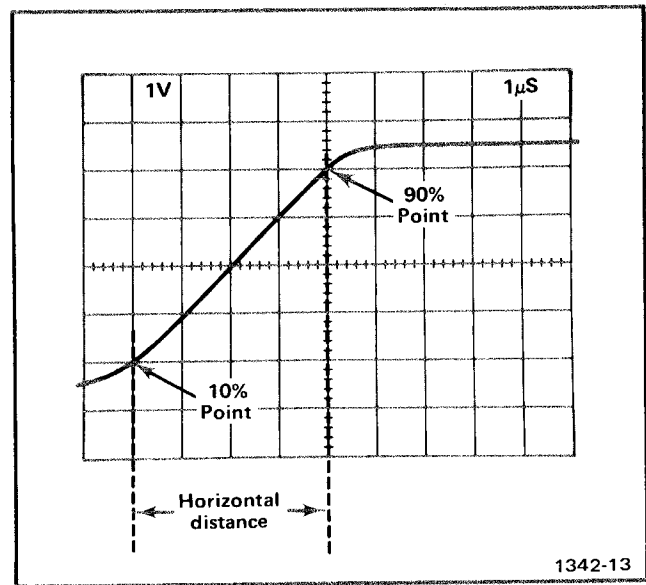


Fig. 2-12. Measuring risetime.

Delayed Sweep Measurement

The delayed sweep mode can be used to make accurate time measurements. The following measurement determines the time difference between two pulses displayed on the same trace. This application may also be used to measure time difference from two different sources (dual-trace) or to measure time duration of a single pulse. See Section 2 for measurement accuracy.

1. Connect the signal to be displayed to the input of the vertical unit.

2. Set the vertical and horizontal Mode switches on the indicator oscilloscope to display the plug-in units used.

3. Set the Volts/Division switch of the vertical unit to produce a display about 4 divisions in amplitude.
4. Adjust the MAIN TRIGGERING controls for a stable display.
5. If possible, set the TIME/DIV OR DLY TIME switch to a sweep rate which displays about eight divisions between pulses.
6. Set the DLY'D Time/Division switch to a setting 1/100 of the TIME/DIV OR DLY TIME switch setting and pull out the DLY'D Time/Division switch for the INTEN Display Mode. This produces an intensified portion approximately 0.1 division in length.

NOTE

Measurement accuracy will be affected if the LEVEL control setting for MAIN TRIGGERING or horizontal POSITION control setting is changed.

7. Rotate the DELAY TIME MULT dial to move the intensified portion of the trace to the first pulse.
8. Press in the DLY'D Time/Division switch for the DLY'D SWP Display Mode.
9. Adjust the DELAY TIME MULT dial to move the pulse (or the rising portion) to the center vertical graticule line. Note the exact setting of the dials.

10. Turn the DELAY TIME MULT dial clockwise until the second pulse is positioned to the same point as the first pulse. (If several pulses are displayed, return to the INTEN DISPLAY MODE to locate the correct pulse.) Again note the exact dial setting.

11. Subtract the first dial setting from the second and multiply by the delay time shown by the TIME/DIV OR DLY TIME switch. This figure is the time interval between pulses.

Example. Assume the first dial setting is 1.31 and the second dial setting 8.81 with the TIME/DIV OR DLY TIME switch set to 2 ms (see Fig. 2-13).

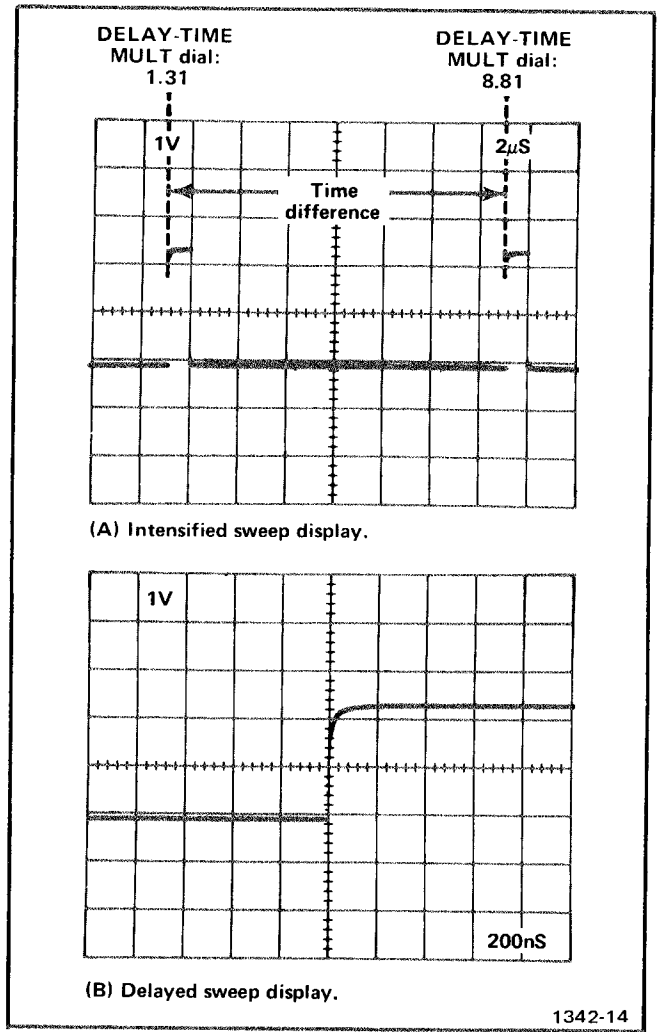


Fig. 2-13. Measuring time difference using delayed sweep.

$$\text{Time Difference (Delayed Sweep)} =$$

$$\frac{\text{second dial setting} - \text{first dial setting}}{\text{delay time (TIME/DIV OR DLY TIME switch setting)}} \times$$

Substituting the given values:

$$\text{Time Difference} = (8.81 - 1.31) \times 2 \mu\text{s}$$

The time difference is 15 μs .

Delayed Sweep Magnification

The delayed sweep feature of the 7B53A/7B53AN provides apparent magnification of the displayed waveform. The sweep rate of the delayed sweep is not actually increased; the apparent magnification is the result of delaying the Delayed Sweep an amount of time selected by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial before the display is presented at the sweep rate selected by the DLY'D Time/Division switch. The following method uses the RUNS AFTER DLY TIME DLY'D TRIG Mode to allow the delayed portion of the display to be positioned with the DELAY TIME MULT dial. If there is too much jitter in the delayed sweep display, use the Triggered delay sweep magnification procedure which follows this procedure.

1. Connect the signal to be displayed to the input connector of the vertical unit. Set the Vertical and Horizontal Mode switches on the indicator oscilloscope to display the plug-in units used.

2. Set the Volts/Division switch of the vertical unit to produce a display about 4 divisions in amplitude.

3. Adjust the MAIN TRIGGERING controls for a stable display.

4. Set the TIME/DIV OR DLY TIME switch to a sweep rate which displays the complete waveform (see Fig. 2-14).

5. Pull out the DLY'D Time/Division switch for the INTEN Display Mode. Rotate the DLY'D TRIG LEVEL control clockwise to RUNS AFTER DLY TIME.

6. Position the start of the intensified portion with the DELAY TIME MULT dial to the part of the display to be magnified.

7. Set the DLY'D Time/Division switch to a setting which intensifies the full portion of the display to be magnified. The start of the intensified trace will remain as positioned in step 6.

8. Press in the DLY'D Time/Division switch for the DLY'D SWP Display Mode.

9. Time Measurements can be made from the display in the conventional manner. Sweep rate is determined by the setting of the DLY'D Time/Division switch.

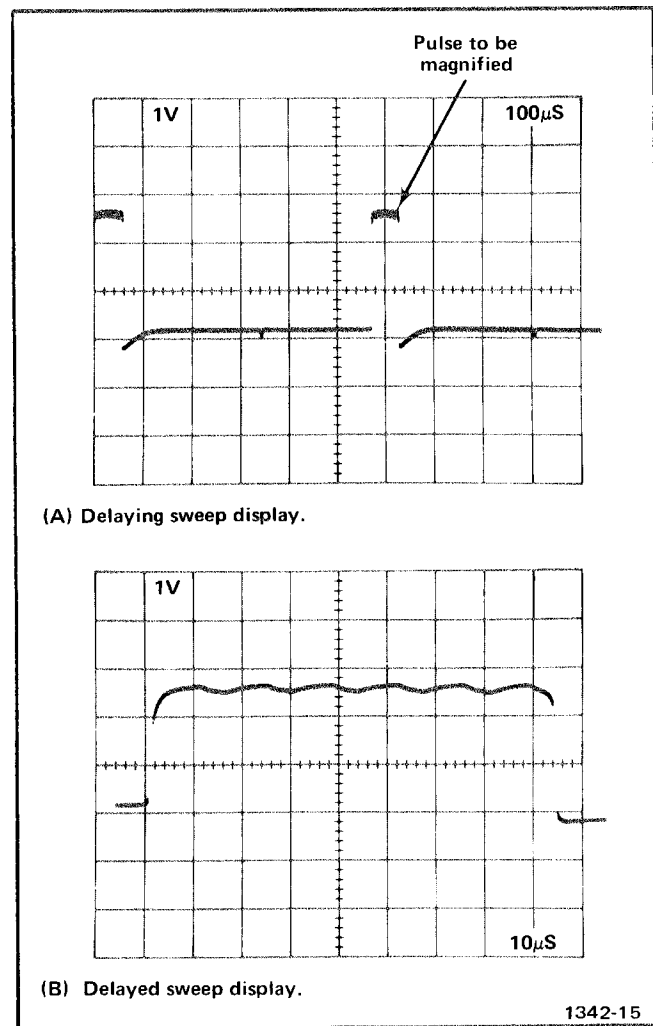


Fig. 2-14. Using delayed sweep for magnification.

10. The apparent sweep magnification can be calculated by dividing the TIME/DIV OR DLY TIME switch setting by the DLY'D Time/Division switch setting.

Example. The apparent magnification of the display shown in Fig. 2-14 with a TIME/DIV OR DLY TIME setting of .1 ms and a DLY'D Time/Division switch setting of 10 μs is:

$$\text{Apparent Magnification} = \frac{\text{TIME/DIV OR DLY TIME setting}}{\text{DLY'D Time/Division setting}}$$

Substituting the given values:

$$\text{Apparent Magnification} = \frac{1 \times 10^{-4}}{1 \times 10^{-5}}$$

The apparent magnification is 10 times.

Triggered Delayed Sweep Magnification

The delayed sweep magnification method just described may produce too much jitter at high apparent magnification ranges. The Triggered Delayed Sweep Mode (DLY'D TRIG LEVEL control rotated out of switch detent) provides a more stable display, since the delayed sweep display is triggered at the same point each time.

1. Set up the display as instructed in steps 1 through 7 in the Delayed Sweep Magnification procedure.

2. Rotate the DLY'D TRIG LEVEL control in a counterclockwise direction but out of switch detent for a triggerable delayed sweep. Select the desired DLY'D TRIG SLOPE, COUPLING, and SOURCE.

3. Adjust the DLY'D TRIG LEVEL control to produce an intensified portion on the display.

4. Inability to produce an intensified portion of the display indicates that the DLY'D TRIG controls are incorrectly set, or that the signal does not meet triggering requirements. If the condition cannot be remedied with the DLY'D TRIG controls or by increasing the display amplitude (lower Volts/Division setting), externally trigger the delayed sweep.

5. When the correct portion of the display is intensified, press in the DLY'D Time/Division switch for the DLY'D SWP Display Mode, slight readjustment of the DLY'D TRIG LEVEL control may be necessary to produce a stable delayed sweep display.

6. Measurement and magnification are as described above in Delayed Sweep Magnification discussion.

Displaying Complex Signals Using Delayed Sweep

Complex signals often consist of a number of individual events of differing amplitudes. Since the trigger circuits are sensitive to changes in signal amplitude, a stable display can normally be obtained only when the sweep is triggered by the event(s) having the greatest amplitude. However, this may not produce the desired display of a lower-amplitude portion which follows the triggering event. The delayed sweep feature provides a means of delaying the start of the delayed sweep by a selected time following the event which triggers the main sweep generator. Then, the part of the waveform which contains the information of interest can be displayed at the delayed sweep rate.

Use the following procedure:

1. Set up the display as given in steps 1 through 8 of Delayed Sweep Magnification.

2. Time measurements can be made from the display in the conventional manner. Sweep rate is determined by the setting of the DLY'D Time/Division switch.

Example. Fig. 2-15 shows a complex waveform as displayed on the crt. The circled portion of the waveform cannot be viewed in any greater detail because the sweep is triggered by the larger amplitude pulses at the start of the display and a faster sweep rate moves this area of the waveform off the viewing area. The second waveform shows the area of interest magnified 10 times using Delayed Sweep. The DELAY TIME MULT dial has been adjusted so the delayed sweep starts just before the area of interest.

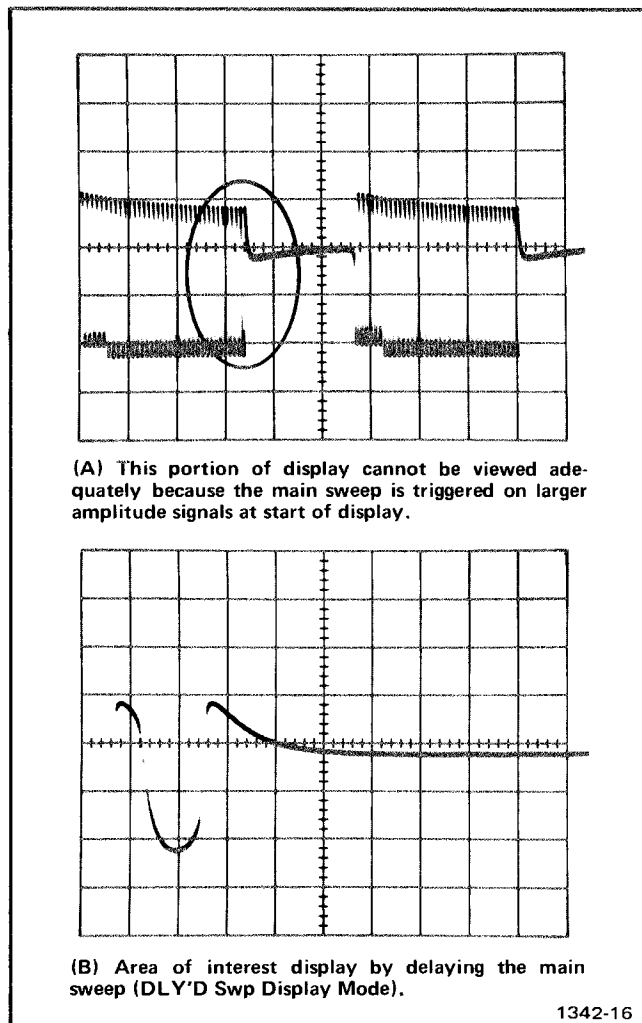


Fig. 2-15. Displaying a complex signal using delayed sweep.

Pulse Jitter Measurement

In some applications it is necessary to measure the amount of jitter on the leading edge of a pulse or jitter between pulses.

1. Connect the signal to be displayed to the input connector of the vertical unit. Set the Vertical and Horizontal Mode switches on the indicator oscilloscope to display the plug-in units used.

2. Set the Volts/Division switch on the vertical unit to produce a display about four divisions in amplitude.

3. Adjust the MAIN TRIGGERING controls for a stable display.

4. Set the TIME/DIV OR DLY TIME switch to a sweep rate which displays the complete waveform (see Fig. 2-14).

5. Pull out the DLY'D Time/Division switch for the INTEN Display Mode.

6. Position the start of the intensified portion with DELAY TIME MULT dial to the part of the display to be magnified.

7. Set the DLY'D Time/Division switch to a setting which intensifies the full portion of the display to be magnified. The start of the intensified trace will remain as positioned in step 6.

8. Press in the DLY'D Time/Division switch for the DLY'D SWP Display Mode.

9. Slight readjustment of the MAIN TRIGGERING LEVEL control may be necessary to produce as stable a display as possible.

10. Pulse jitter is shown by horizontal movement on the pules (take into account inherent jitter of delayed sweep). Measure the amount of horizontal movement. Be sure that both vertical and horizontal VARIABLE controls are set to CAL.

11. Multiply the distance measured in step 10 by the DLY'D Time/Division switch setting to obtain pulse jitter in time.

Example. Assume that the horizontal movement is 0.5 division (see Fig. 2-16) and the DLY'D Time/Division switch is $.5 \mu s$.

Using the formula:

$$\text{Pulse Jitter} = \frac{\text{horizontal jitter (divisions)}}{\text{DLY'D Time/Division setting}} \times \text{DLY'D Time/Division setting}$$

Substituting the given values:

$$\text{Pulse Jitter} = 0.5 \times 0.5 \mu s$$

The pulse jitter is $0.25 \mu s$.

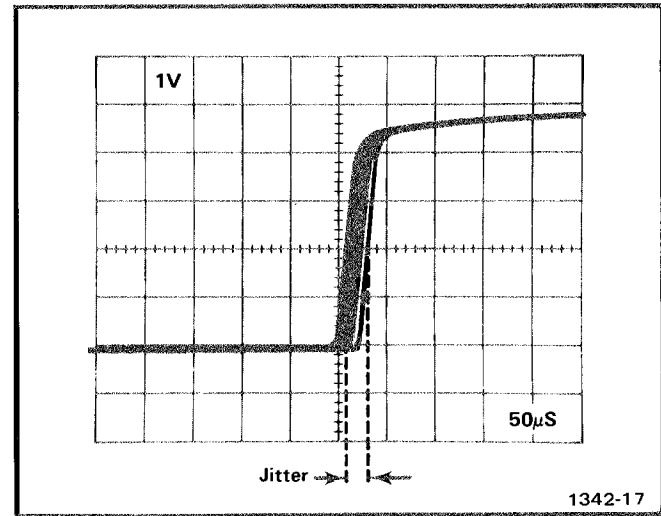


Fig. 2-16. Measuring pulse jitter.

Repackaging for Shipment

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal carton with shipping tape or industrial stapler.

The carton test strength for your instrument is 200 pounds.

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

THEORY OF OPERATION

Introduction

This section of the manual contains a description of the circuitry used in the 7B53A/7B53AN Dual Time Base. The description begins with a discussion of the major circuit functions using a simplified block diagram.

SIMPLIFIED BLOCK DIAGRAM

The Simplified Block Diagram, Fig. 3-1, shows interconnection of the basic circuit blocks in the 7B53A/7B53AN. In some cases, such as the Main Sweep Trigger, the block includes a number of separate circuits. The individual circuits are discussed in detail later in this section.

Main Sweep Mode

When the TIME/DIV OR DLY TIME switch is set to select MAIN SWP, operation is as follows:

Main Sweep Trigger. This block includes circuitry for selecting the trigger source, type of coupling, triggering mode, and point on the trigger signal where triggering occurs. Also, regardless of the trigger signal shape or amplitude (within specification), this circuitry provides a fast-rise, uniform-amplitude pulse to the Main Sweep Start Comparator. Termination of the pulse (or gate) occurs at the rise of Main Sweep Holdoff.

Main Sweep Start Comparator. This circuit is activated by the positive gate from the Main Sweep Trigger. The output signal coupled to the Main Sawtooth Generator is a positive gate with the same duration as the sweep. This gate is also coupled to the Sweep Gate Out. A negative-going gate (coincident with the positive gate) is coupled to the Delayed Sweep Lockout Multi and the Delayed Sweep Start Control.

Main Sawtooth Generator. The main sweep signal is developed by the Main Sawtooth Generator. When a positive gate from the Main Sweep Start Comparator is applied, a sawtooth waveform is generated. The sawtooth duration is determined by the positive gate duration. Rate of change of the sawtooth is set by Ct and Rt, selected by the TIME/DIV switch.

Sweep Stop Comparator. One side of this comparator is driven by the main sweep sawtooth signal, and the other

side is set by the Main Swp Stop adjustment. When the sawtooth waveform passes through the setting of the Main Swp Stop adjustment, the output of the Sweep Stop Comparator switches to a positive level. This positive step is applied to the Main Sweep Holdoff.

Main Sweep Holdoff. This circuit develops a gate which is used to prevent generation of a trigger signal until the sweep circuits have stabilized after a sweep. The positive step from the Sweep Stop Comparator initiates the positive holdoff gate. The duration of the hold off gate is variable, depending on the setting of the TIME/DIV OR DLY TIME switch. Holdoff timing capacitors are separate from sweep timing capacitors. Holdoff is longer for slower sweep rates.

Output from the Main Sweep Holdoff is coupled to the Main Sweep Trigger and the Delayed Sweep Holdoff circuit. A trigger signal cannot be generated during the holdoff interval. The holdoff serves to reset the trigger circuits so that they are ready to receive an input trigger signal after holdoff.

Horiz Output. The Horiz Output block includes the Ext Horiz Amp, Position Amp, Horiz Display Selector, and Horiz Out Amp circuits.

With the TIME/DIV OR DLY TIME switch set for main sweep, this circuit selects the signal from the Main Sawtooth Generator, amplifies the signal, and converts the single-ended input to a push-pull output signal. Dc positioning level is also applied to this block.

Delayed Sweep Mode

To generate the delayed sweep, the Main Sawtooth Generator must first be gated on (see Main Sweep Mode).

Delay Pickoff. This circuit supplies a positive gate which starts when the main sawtooth signal passes through the level selected by the DELAY TIME MULT control. The gate ends with the main sawtooth signal. The output signal is coupled to the Delayed Sweep Holdoff circuitry.

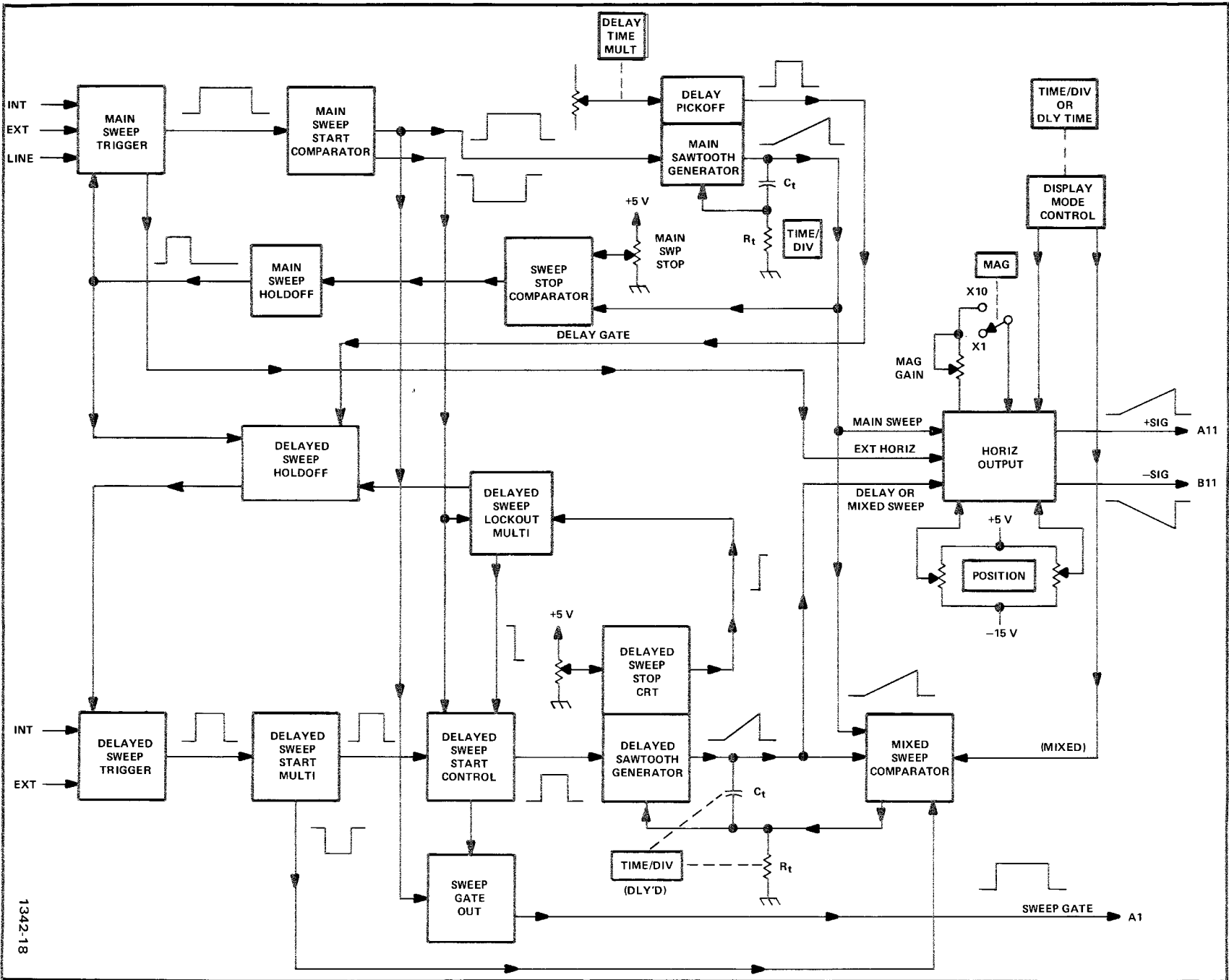


Fig. 3-1. 7B53A/7B53AN Simplified Block Diagram.

Delayed Sweep Trigger. When the DLY'D TRIG LEVEL is set to RUNS AFTER DLY TIME (into switch detent), the output trigger is generated as soon as the delayed gate is applied. If the DLY'D TRIG LEVEL control is in the triggerable mode (out of switch detent), the output trigger is initiated by the next input trigger that occurs after the Delay Gate is applied.

The Delayed Sweep Trigger output is a positive gate which is terminated by the Holdoff signal or the positive step from the Delayed Sweep Stop circuit. The positive output gate is coupled to the Delayed Sweep Start Multi.

Delayed Sweep Start Multi. The signal from the Delayed Sweep Trigger causes the Delayed Sweep Start Multi to flip so that a positive gate is coupled to the Delayed Sweep Start Control, and a negative gate is applied to the Mixed Sweep Comparator. The output gates are the same in duration as the positive gate from the Delayed Sweep Trigger.

Delayed Sweep Start Control. For delayed sweep mode of operation the Delayed Sweep Start Control serves to couple the positive gate from the Delayed Sweep Start Multi to the Delayed Sawtooth Generator and the Sweep Gate Out.

Input signals from the Main Sweep Start Comparator and the Delayed Sweep Lockout Multi are not effective in this mode.

Delayed Sawtooth Generator. The delayed sweep signal is developed by the Delayed Sawtooth Generator. The sawtooth is generated during the time that a positive gate is applied from the Delayed Sweep Start Control. Rate of change of the sawtooth is set by Ct and Rt, selected by the TIME/DIV (Dly'd) switch.

The sawtooth output signal is coupled to the Mixed Sweep Comparator and the Horiz Output circuits.

Delayed Sweep Stop Circuit. A positive step occurs at the output of the Delayed Sweep Stop circuit when the delayed sawtooth passes through the level selected by the Dly'd Swp Length adjustment. This step is coupled to the Delayed Sweep Trigger and the Delayed Sweep Lockout Multi.

Mixed Sweep Mode

In this mode of operation, the sweep is first running at the main sweep rate and then, after the selected delay interval, runs at the delayed sweep rate. The main sweep

and delayed sweep are initiated as previously described. Operation of other circuit blocks follows.

Mixed Sweep Comparator. This circuit determines whether the delayed sweep generator runs at the main sweep rate or at the delayed sweep rate. Before the delay gate is generated (delay gate generated at delay pickoff as determined by the setting of the DELAY TIME MULT dial) the main sweep sawtooth signal is coupled through the Mixed Sweep Comparator, causing the delayed sweep generator to run at the main sweep rate. The resulting sawtooth signal is coupled to the Horizontal Output stage.

When a positive gate from the Delayed Sweep Trigger is applied to the Delayed Sweep Start Multi (at Delay Pickoff as determined by the DELAY TIME MULT dial setting) a negative gate is generated and coupled to the Mixed Sweep Comparator. This opens the Mixed Sweep Comparator, preventing the Delayed Sweep Generator from running at the main sweep rate. Simultaneously, the Delayed Sweep Generator is released to run at the delayed sweep rate.

Delayed Sweep Lockout Multi. The positive step from the Delayed Sweep Stop circuit is inverted by the Delayed Sweep Lockout Multi and coupled to the Delayed Sweep Start Control, thus turning off the Delayed Sawtooth Generator.

Sweep Gate Out. Depending on the selection of the TIME/DIV switch, this stage couples the positive gate from either the Main Sweep Start Multi or the Delayed Sweep Start Control to connector A1. The Sweep Gate signal serves to unblank the crt in the Oscilloscope during the sweep.

External Horiz Input

When the TIME/DIV switch is set to AMPL, part of the Main Sweep Trigger circuitry becomes the Horiz Input Amp. An external signal connected to the MAIN TRIG IN or AMPL input is amplified and then coupled to the Horiz Output stage. The main and delayed sawtooth generators are disabled to prevent intensity modulation of the crt trace by the unblanking waveforms.

CIRCUIT OPERATION

General

This section provides a detailed description of the electrical operation and relationship of the circuits in the 7B53A/7B53AN. The theory of operation for circuits unique to this instrument is described in detail in this discussion. Circuits which are commonly used in the electronics industry are not described in detail. If more

Theory of Operation—7B53A/7B53AN

information is desired in these commonly used circuits, refer to the following text-books.

Phillip Cutler, "Semiconductor Circuit Analysis", McGraw-Hill, New York, 1964.

Lloyd P. Hunter (Ed.), "Handbook of Semiconductor Electronics", second edition, McGraw-Hill, New York, 1962.

Jacob Millman and Herbert Taub, "Pulse, Digital, and Switching Waveforms", McGraw-Hill, New York, 1965.

The main headings in this circuit analysis refer to schematics in the diagrams section with the same name. The sub-headings indicate the individual circuit being described.

MAIN TRIGGER PREAMP

The Main Trigger Preamp converts the push-pull internal trigger signal to a single-ended signal and selects the main trigger source and coupling for the Main Trigger Generator. Fig. 3-2 shows a detailed block diagram of the Main Trigger Preamp. The schematic of this circuit is shown on diagram 1 at the rear of this manual.

Trigger Preamp. The push-pull trigger signal from the Vertical Deflection System is converted to a single-ended output by emitter-coupled stage Q52-Q61. The output of Q61 drives current gain stage Q66-Q70. The dc level of the output is set by internal Trig DC Bal Control, R72.

Input Switching. The MAIN TRIGGERING SOURCE switch, S10, selects the source of the trigger signal. Three trigger sources are available; internal, line, and external. The external signal may also be passed through a \div 10 attenuator network.

The MAIN TRIGGERING COUPLING switch, S20, offers a means of attenuating high or low frequency components of the trigger signal. In addition to ac and dc coupling, C23-R23 can be selected to provide low-frequency attenuation and R25-C25-C26 for high-frequency attenuation.

MAIN TRIGGER GENERATOR (SN B210000 & UP 7B53A ONLY)

The Main Trigger Generator provides selection of the level and slope where triggering occurs and supplies a fast-rise pulse to the main sweep start comparator. Fig. 3-3

shows a detailed block diagram of the Main Trigger Generator; the schematic of this circuit is shown on diagram 2 at the rear of this manual.

Input Stage. The input source-follower, Q310, provides a high input impedance for the trigger signal. It also provides isolation between the Main Trigger Generator and the input source. Input protection diode CR307 protects Q310 from excessive input signals by clamping the gate of the input FET if the input exceeds about -15 V. The signal at the source of Q310 is passing through emitter-follower Q315 to the base of Q320 in the Slope Comparator and to the External Horizontal circuit.

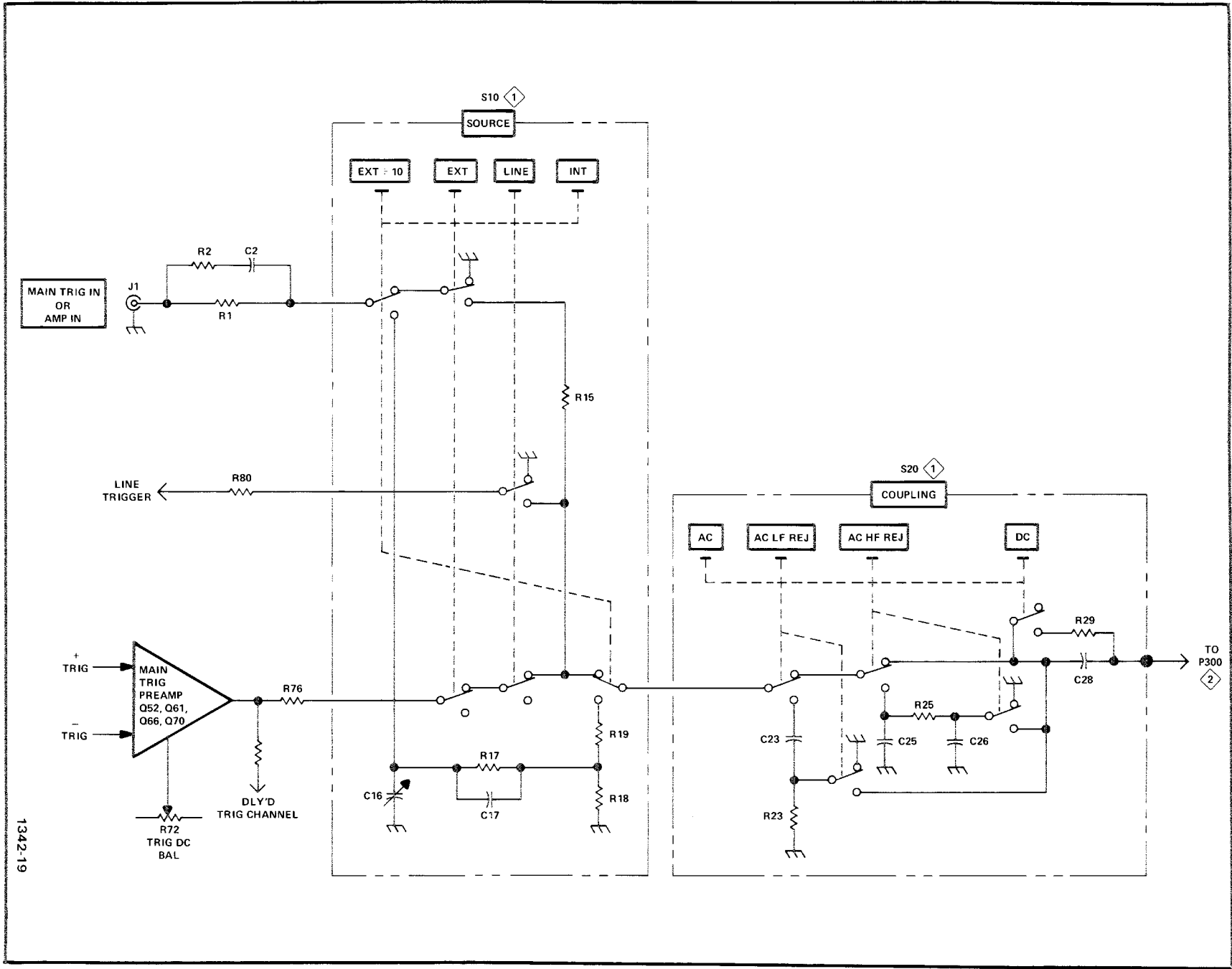
Slope Comparator. Q320 and Q322 are connected as a difference amplifier to provide selection of the slope and level at which the sweep is triggered. The reference voltage for the comparator is provided by LEVEL control R4 and Main Trig Level Center control R333. R333 sets the level at the base of Q322 so that the display is triggered at the 0 V dc level of the incoming trigger when the LEVEL control is centered. When MAIN TRIGGERING LEVEL control R4 is set to midrange, the base of Q322 is at approximately 0 V. This corresponds to the 0 V level at the input of Q320, thus switching the comparator at the 0 V level of the trigger signal. As the LEVEL control is turned clockwise, the voltage level on the base of Q322 becomes more positive. Now the trigger signal must rise to a more positive level before comparison takes place. The resultant crt display starts at a more positive point on the displayed signal. When the LEVEL control is turned counterclockwise from 0, the result is the opposite of the above reaction and produces a crt display that starts at a more negative point along the $+$ slope of the trigger signal.

R326 establishes the emitter current for Q320 and Q322. The transistor with the most positive base controls conduction of the comparator. For example, assume that the trigger signal from the input stage is positive-going and Q320 is forward biased. The increased current flow through R326 makes the emitter of Q322 more positive and since the base is held constant by the level control voltage, the current through Q322 decreases. The increased current through Q320 makes the voltage at pin 14 of U350 less positive, and the decrease in current through Q322 makes voltage at pin 13 of U350 more positive.

Trigger Generator

An Integrated circuit converts the trigger signal from the trigger comparator to a gate waveform used for sweep control. With pin 1 connected to ground ($+$ SLOPE), a positive-going waveform on the input (pin 13) causes pin 3 (output) to rise to about 4.1 V and pin 4 (output) to drop to about 3.2 V. Pin 14 is negative going under the above conditions. The output gate occurs when pins 13 and 14 are within about 40 mV of each other. Opening pin 1

Fig. 3-2. Trigger Preamp and Input Switching Block Diagram.



1342-19

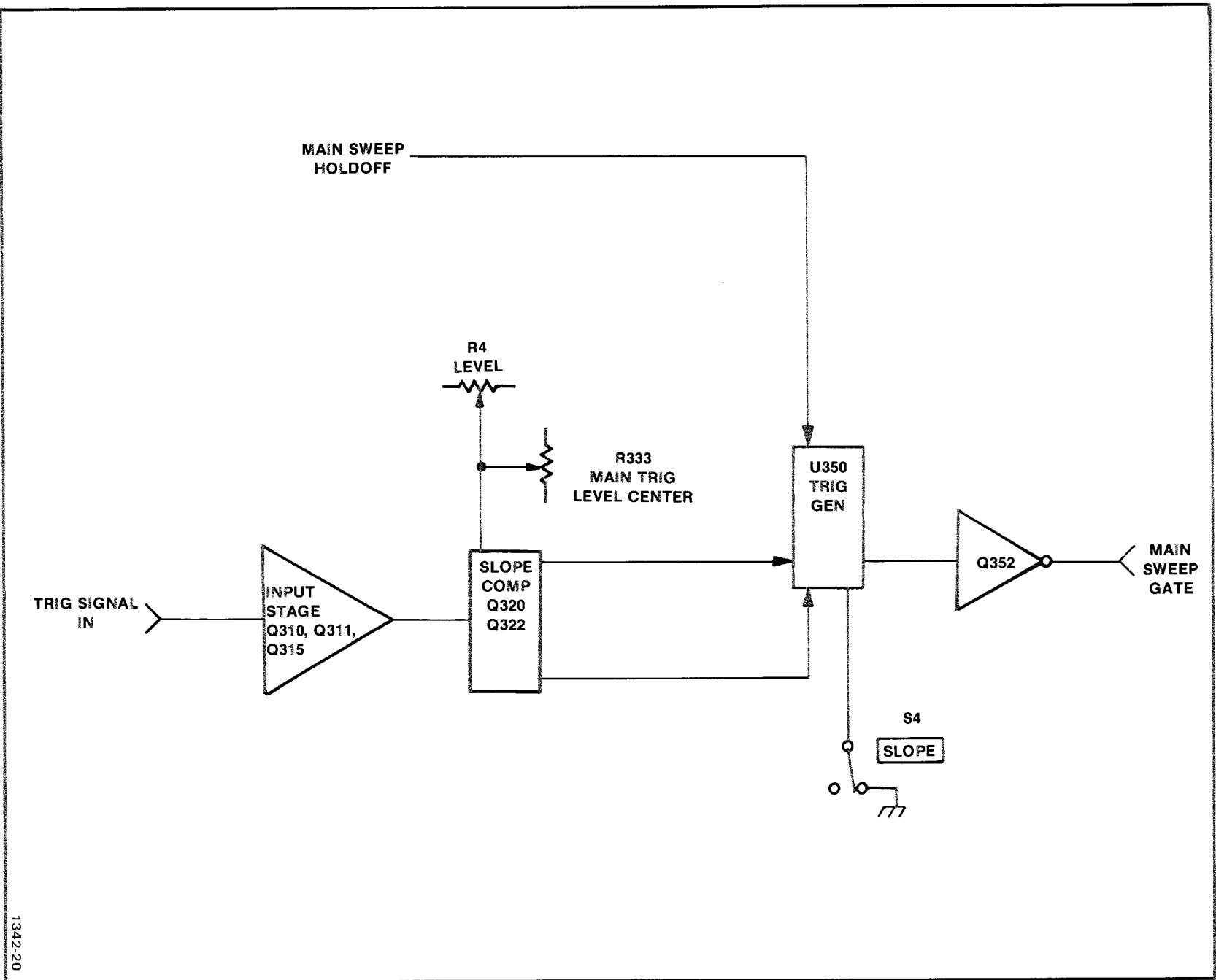


Fig. 3-3. Main Trigger Generator Block Diagram (SN B210000 and up 7B53A Only).

1342-20

(- SLOPE) creates an output gate at pins 3 and 4 when pin 13 is negative going and pin 14 positive going. The output of pin 4 is inverted by Q352. After completion of the sweep (during holdoff time) pins 6 and 10 are high (about +4.2 V). This action inhibits the trigger generator until these pins drop to about 3.2 V, which occurs after holdoff time.

MAIN TRIGGER GENERATOR (SN B209999 & BELOW)

The Main Trigger Generator provides selection of the level and slope where triggering occurs and supplies a fast-rise pulse to the main sweep start comparator. Fig. 3-4 shows a detailed block diagram of the Main Trigger Generator; the schematic of this circuit is shown on diagram 2 at the rear of this manual.

Input Stage. The input source-follower, Q310, provides a high input impedance for the trigger signal. It also provides isolation between the Main Trigger Generator and the input source. Input protection diode CR307 protects Q310 from excessive input signals by clamping the gate of the input FET if the input exceeds about -15 V. The signal at the source of Q310 is passed through emitter-follower Q315 to the base of Q320 in the Slope Comparator and to the External Horizontal circuit.

Slope Comparator. Q320 and Q322 are connected as a difference amplifier to provide selection of the slope and level at which the sweep is triggered. The reference voltage for the comparator is provided by LEVEL control R4 and Main Trig Level Center control R333. R333 sets the level at the base of Q322 so that the display is triggered at the 0 Vdc level of the incoming trigger when the LEVEL control is centered. When MAIN TRIGGERING LEVEL control R4 is set to midrange, the base of Q322 is at approximately 0 V. This corresponds to the 0 V level at the input of Q320, thus switching the comparator at the 0 V level of the trigger signal. As the LEVEL control is turned clockwise, the voltage level on the base of Q322 becomes more positive. Now the trigger signal must rise to a more positive level before comparison takes place. The resultant crt display starts at a more positive point on the displayed signal. When the LEVEL control is turned counterclockwise from 0, the result is the opposite of the above reaction and produces a crt display that starts at a more negative point along the + slope of the trigger signal.

R326 establishes the emitter current for Q320 and Q322. The transistor with the most positive base controls conduction of the comparator. For example, assume that the trigger signal from the input stage is positive-going and Q320 is forward-biased. The increased current flow through R326 makes the emitter of Q322 more positive, and since the base is held constant by the level control

voltage, the current through Q322 decreases. The increased current through Q320 makes the voltage at pin 4 of U350A less positive, and the decrease in current through Q322 makes voltage at pin 10 of U350C more positive. Notice that the signal currents at the collectors of Q320 and Q322 are opposite in phase. The sweep can be triggered from either the positive or negative edge of the input signal. The selection is made by SLOPE switch S4.

When SLOPE switch S4 is set to +, the voltage between R347 and R346 decreases and activates U350A by providing a low voltage level at pin 5 of U350A. A low level is also applied to pins 6 and 7 of U350B. The low level is inverted by U350B and this high level is applied to pin 11 of U350C. Thus, pin 14 of U350C goes low, as does pin 13 of U350D. Since pin 11 of U350C is high, pin 10 of U350C has no effect. If pin 4 of U350A goes low, pin 2 goes high. Pin 12 of U350D also goes high causing pin 9 of U350D to go high and the output at pin 3 of inverter U355B to go low. However, if pin 4 of U350A goes high, the process reverses and the output at pin 3 of U355B also goes high. Thus, pin 3 of U355B follows the input at pin 4 of U350A.

When the SLOPE switch S4 is set to -, +15 V is applied to pin 5 of U350A. Pin 2 goes low, as does pin 12 of U350D. Pin 12 is held low, regardless of what happens at pin 4 of U350A. The +5 V at pin 5 of U350A is inverted by U350B, which makes pin 11 of U350C go low. Pin 3 of U355B now follows the signal at pin 10 of U350C.

R341, R339, and CR340, (between pin 3 of U355B and pin 4 of U350A), provide regenerative feedback. R343, R342, and CR343 provide regenerative feedback to pin 10 of U350C.

In the reset condition, pin 15 of U375B is low, as is pin 12 of U355D. When a negative pulse is applied to pin 4 of U350A, pin 3 of U355B goes low as well as pin 13 of U355D. Thus, pin 15 of U355D goes high, which sets pin 2 of U375A to the high state and provides the sweep gate output (trigger pulse) through Q382 and pin C to the Main Sweep Start Comparator. At the end of sweep, the positive-going holdoff pulse is coupled to the Sweep Gate Reset circuit through pin B. The high level at the base of Q366 turns it on, causing pin 4 and 5 of U355A to go low coincident with the holdoff pulse. Therefore, pin 2 of inverter U355A goes high and resets U375A. Pin 2 of U375A goes low and terminates.

The high at pin 2 of U355A sets U375B, causing pin 12 of U355D to go high and locking out any trigger pulse during the holdoff period. While pin 12 of U355D is high, pin 15 of U355D will stay low regardless of the state of pin 13 of U355D.

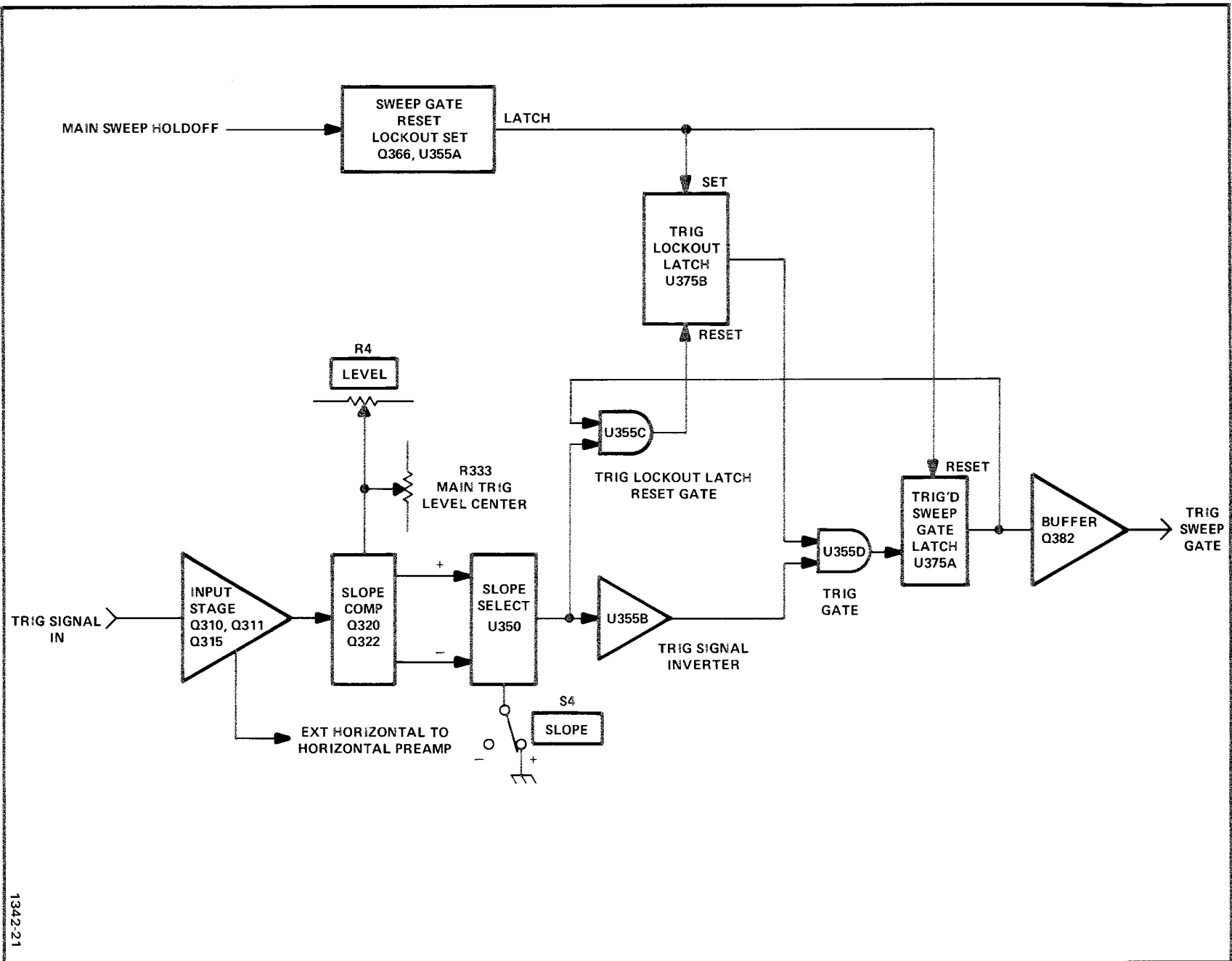


Fig. 3-4. Main Trigger Generator Block Diagram (SN B209999 and below).

Trigger Lockout Latch U375B can only be reset when Trig'd Sweep Gate Latch U375A is in the reset condition (pin 2 of U375A low, pin 11 of U355C low, and pin 13 of U355D high). Therefore, if pin 13 of U355D is low when the holdoff pulse terminates, U375B will stay set. When pin 13 of U355D goes positive, pin 11 of U355C goes negative, causing a positive level at pin 14 of U355C. This positive level resets trigger lockout latch U375B, causing pin 12 of U355D to go negative and allowing the next negative transition at pin 13 of U355D to set the trigger sweep gate latch U375A. This generates a new sweep gate at pin C.

MAIN SWEEP GENERATOR

The Main Sweep Generator circuit produces a sawtooth voltage which is amplified by the Horizontal Amplifier circuit to provide horizontal sweep deflection on the crt of the indicator oscilloscope. This output signal is generated on command (trigger pulse) from the Main Trigger Generator. The Main Sweep Generator also produces a Main Sweep Gate pulse coincident with the time that the Main Sweep runs. The Main Gate pulse is processed by the Sweep Gate Out circuit and the indicator oscilloscope for crt unblanking and Auxiliary Gate output. In addition, the Main Sweep Generator produces several control signals for other circuits within the instrument. Fig. 3-5 shows a detailed block diagram of the Main Sweep Generator and the schematic is shown on diagram 3 at the rear of the manual.

The MAIN TRIGGERING MODE switch allows three modes of operation. When the NORM button is pressed, a sweep is produced only when a trigger pulse is received from the Main Trigger Generator circuit. When the AUTO button is pressed, a sweep is produced as in NORM except that a free-running trace is displayed when a trigger pulse is not present. SINGLE SWP operation is also similar to NORM operation except that the sweep is not recurrent. The RESET button must be pressed to view another trace. The following circuit description is given with the MAIN TRIGGERING MODE switch pressed to NORM. Difference in operation for the other two modes is discussed later.

Main Sweep Start Comparator

Q544, Q547, and Q551 compose the Main Sweep Start comparator. In the absence of a trigger, Q544 is off and Q547 is held on by the high level from pin 3 of U520. The collector of Q547 is low and this low is coupled through emitter-follower Q551 to pin 1 of U580, thus preventing a sweep. When the Main Trigger Generator supplies a trigger, the positive transition is coupled to the base of Q544. The base of Q544 rises above the level at the base of Q547 and the current through common emitter resistor R545 is diverted from Q547 to Q544. The collector of Q547 rises and the positive step is coupled through emitter-follower Q551. The positive step appears across divider

R555/R556, causing pin 1 of U580 to go positive and start the sweep.

Sawtooth Generator

The lower half of the U580 diagram symbol constitutes a Miller Integrator. When pin 1 is positive, a linear sawtooth (positive-going) is generated and appears at pin 8. The timing components (Rt and Ct), connected to pins 8 and 9, determine the rate of change of the sawtooth waveform. Q596 prevents high-speed error currents from being coupled into U580 by way of C579 and pin 9.

Sweep Stop Comparator

The Sweep Stop Comparator consists of Q564 and Q568. In the absence of a sawtooth signal at pin 8 of U580, Q568 is conducting and Q564 is held off by the positive level set at its base by R564, the Main Sweep Length adjustment. When the sawtooth voltage at pin 8 of U580 raises the base of Q568 higher than the base of Q564, Q568 turns off and Q564 turns on. The collector of Q564 rises and the positive step is coupled through emitter-follower Q538 to pin 16 of U520 and sweep holdoff begins.

Holdoff Circuit

The Holdoff Circuit consists of pins 8, 10, 16, and 17 of U520 plus R and C time constants selected by the TIME/DIV switch. The holdoff prevents re-triggering the sweep generator until after the sweep timing capacitor(s) has discharged and the sweep circuits are again ready to generate a sweep.

At the end of the sawtooth waveform, a positive step is coupled to pin 16 of U520 by way of the Sweep Stop Comparator as previously described. The positive pulse seen at pin 16 of U520 is coupled internally through U520 to pin 17 and in turn to Q362 in the Main Trigger Generator. The Main Trigger Generator is reset and the output at connector pin C goes low. As a result, Q544 turns off and Q547 turns on. The collector of Q547 drops and the negative step is coupled through emitter-follower Q551, thus ending the sweep.

After a time determined by the timing components at pin 8, internal circuitry within U520 switches pin 17 to its low state and ends the holdoff gate. The Main Trigger Generator is released to generate a trigger signal.

A negative gate, coincident with the positive holdoff gate, appears at pin 10 of U520. This negative gate is inverted by Q528 and coupled to the Delayed Sweep Generator for composite holdoff functions.

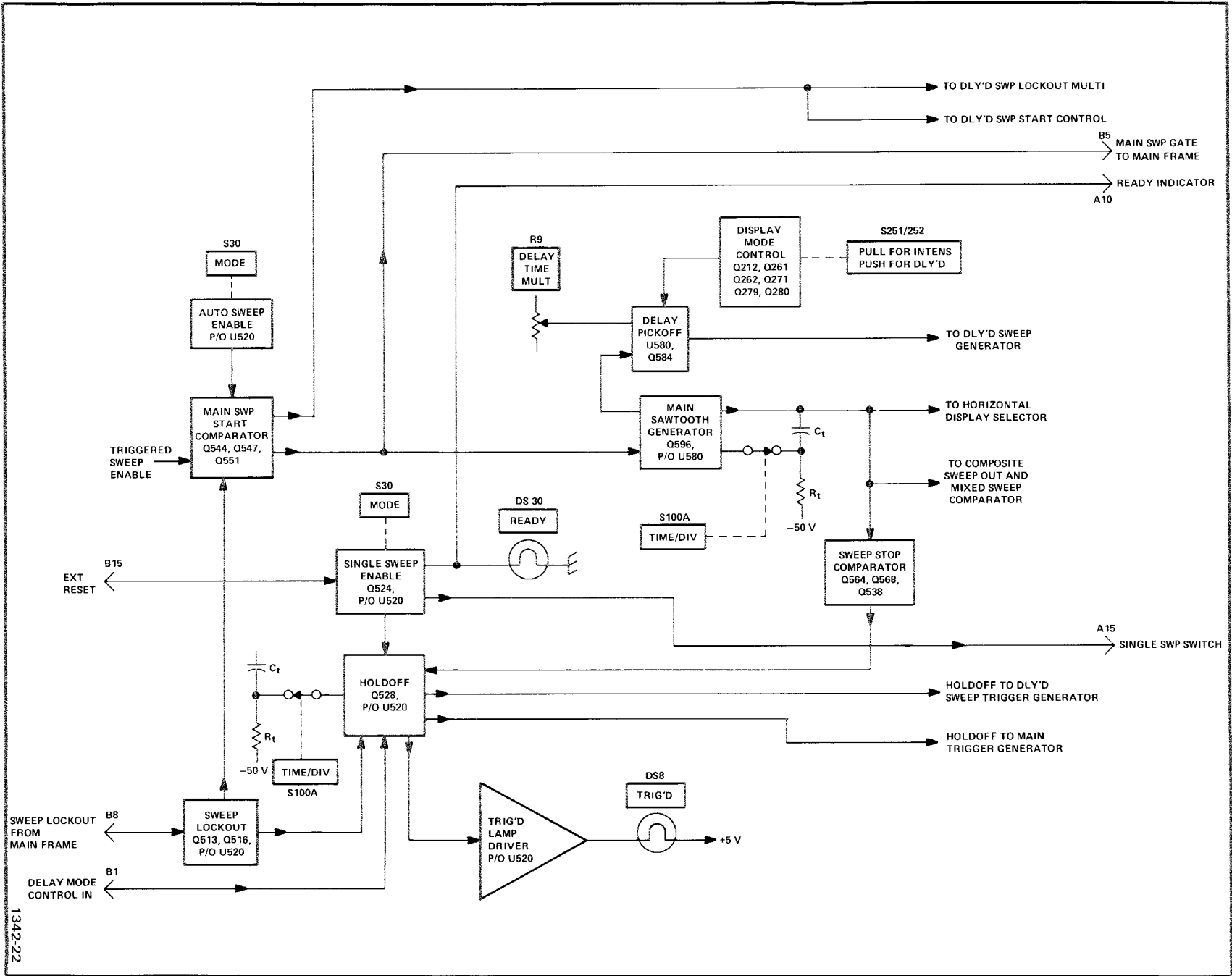


Fig. 3-5. Main Sweep Generator Block Diagram.

Trig'd Lamp Driver

When the main sweep gate is high and the sweep is running, the TRIG'D lamp is on. At all other times the lamp is off.

Delay Pickoff

The upper half of the diagram symbol for U580 includes the Delay Pickoff circuitry. Inside U580, the main sweep sawtooth signal is applied to one side of a comparator circuit. Pin 6 is connected to the other side of the comparator. The setting of DELAY TIME MULTIPLIER control R9 determines the point on the main sweep sawtooth at which the comparator switches.

When the comparator switches (delay pickoff occurs), a positive gate appears at pin 4 of U580. This gate terminates at the end of the main sweep sawtooth.

The positive-going gate at pin 4 of U580 is coupled through emitter-follower Q584 to the Delayed Sweep Holdoff Generator via Q671.

Auto Triggering Mode

Operation of the Main Sweep Generator circuit in the AUTO position of the MAIN TRIGGERING MODE switch is the same as for NORM position just described when a trigger pulse is applied. However, when a trigger pulse is not present, a free-running reference trace is produced in the AUTO position. This occurs as follows:

The Auto Triggering circuit consists of pins 1, 3, 6, and 19 of U520. When the AUTO button of the MAIN TRIGGERING MODE switch is pressed, a low at pin 19 of U520 enables the Auto Circuit. When a repetitive trigger signal above 30 Hz, and of adequate amplitude, is applied to the Main Sweep Start Comparator and pin 1 of U520, the internal Auto Multi at pin 6 of U520 charges towards five volts through C535 and R535, but is discharged by each incoming trigger pulse.

In the absence of a trigger pulse, C535 charges towards +5 V, switching pin 6 to its high state and pin 3 to its low state. Q547 turns off, its collector rises and a high is coupled through emitter follower Q551 to pin 1 of U580, causing the sweep to run.

Single Sweep Operation

Operation of the Main Sweep Generator in the SINGLE SWEEP position of the MAIN TRIGGERING MODE switch is similar to operation in the NORM position as previously described. However, after one sweep has run, all other sweeps are inhibited until the RESET button is pressed. A READY lamp is provided to indicate when the sweep is ready to accept a trigger.

The Single Sweep circuit consists of pins 11, 12, 14, 15, and 17 of U520. For SINGLE SWP operation, the +5 V supply is applied to pin 12 of U520. The holdoff pulse at pin 17 of U520 goes positive, preventing generation of a sweep. When the RESET button is pressed, pin 15 is momentarily held to ground and pin 17 goes low to allow the Main Trigger Generator to accept a trigger. The holdoff line (pin 17 of U520) stays low until a sweep has been completed. At this time, the holdoff pulse rises at pin 17 and stays in the holdoff state until the RESET button is pressed.

Q524 acts as a switch for the READY lamp. When the holdoff gate at pin 17 is high, preventing the sweep generator from accepting a trigger, pin 11 is high and Q524 and the READY lamp are off. When the RESET button is pressed, the holdoff gate at pin 17 goes low and allows the Main Sweep Generator to accept a trigger. Pin 11 rises and turns on Q524, which provides the current to turn on the READY lamp.

Sweep Lockout

Q513, Q516, Q538, and pins 3, 16, and 18 of U520 compose the Sweep Lockout circuit. The Sweep Lockout circuit is functional when the 7B53A/7B53AN is installed in the B Horizontal compartment of an indicator oscilloscope that accommodates two horizontal plug-in units and it is desired to operate in the Alternate Horizontal Mode, or to operate the 7B53A/7B53AN as a delayed sweep unit. Lockout is applied to the 7B53A/7B53AN during the time that the sweep from the associated time base is displayed.

The indicator oscilloscope controls initiation of a sweep by supplying current to the base of Q513 when lockout is required. This current causes a positive step at pin 18 of U520. Pin 3 of U520 steps positive and Q547 turns on. The collector of Q547 falls and the low is coupled through emitter-follower Q551 to pin 1 of U580, thus preventing the sweep. If lockout is initiated while the sweep is running, the leading edge of the lockout pulse is differentiated through C519 and R519, coupled through emitter-follower Q538, and appears as a high at pin 16 of U520. This starts the holdoff cycle. (The holdoff cycle is as described previously.)

Delayed Mode Control

When the 7B53A/7B53AN is installed in the B Horizontal compartment of an indicator oscilloscope with two horizontal compartments, the Delayed Mode Control determines whether the 7B53A/7B53AN operates as an independent time base or as a delayed sweep unit in triggerable after delay time mode. When approximately +3 to 4.5 V is present at interface connector B1 (and therefore pin 13 of U520), the Auto Circuit (previously described) is disabled. A sweep can be enabled only by a trigger pulse

Theory of Operation—7B53A/7B53AN

to the Sweep Start Comparator. During delay time, determined by the settings of the delaying sweep unit, sweep lockout (previously described) inhibits the sweep. After delay time, the 7B53A/7B53AN can be triggered. An approximate zero volt level at pin 13 of U520 enables the Auto Circuit, causing the 7B53A/7B53AN to operate as an independent time base.

DELAYED TRIGGER GENERATOR (SN B210000 & UP 7B53A ONLY)

The Delayed Trigger Generator circuitry is essentially the same as the Main Trigger Generator, except for the Runs After Dly Time and Triggerable After Delay Time modes. Therefore, only the circuitry involving these modes will be described. For detailed description of the remaining delayed trigger circuitry, refer to the Main Trigger Generator discussion. Fig. 3-6 shows a detailed block diagram of the Delayed Trigger Generator; the schematic is shown on diagram 4 at the rear of this manual.

When the DLY'D TRIG LEVEL is set to RUNS AFTER DLY TIME, S5 grounds R457, which turns Q456 off and allows pin 16 of U450 to go high. This generates a new sweep gate at pin 4 of U450.

When the DLY'D TRIG LEVEL control is in the Triggerable After Dly Time mode, Q456 is turned on, which allows pin 16 of U450 to go low and the Delayed Trigger Generator operates in the Triggerable After Dly Time in a manner similar to the Main Trigger Generator operation.

DELAYED TRIGGER GENERATOR (SN B209999 & BELOW)

The Delayed Trigger Generator circuitry is essentially the same as the Main Trigger Generator, except for the Runs After Dly Time and Triggerable After Delay Time modes. Therefore, only the circuitry involving these modes will be described. For detailed description of the remaining delayed trigger circuitry, refer to the Main Trigger Generator discussion. Fig. 3-7 shows a detailed block diagram of the Delayed Trigger Generator; the schematic is shown on diagram 4 at the rear of this manual.

When the DLY'D TRIG LEVEL is set to RUNS AFTER DLY TIME, S5 grounds R469 and pin 4 of U455A is forced to the low state. Thus, pin 2 of U455A will follow pin 5, but reversed in polarity. When the holdoff pulse is applied to the base of Q466, pin 4 of U455C goes to the high state, which resets U475B and terminates the sweep gate. When the holdoff pulse terminates, pin 4 of U455C goes to the

low state and pin 2 of U455A goes to the high state. This sets U475B, which generates a new sweep gate.

When the DLY'D TRIG LEVEL control is in the Triggerable After Dly Time mode, pin 4 of U455A is high and pin 2 is low. Therefore, pin 12 of U475B is also low and the Delayed Trigger Generator operates in the Triggerable After Dly Time mode in a similar way as the Main Trigger Generator operates.

DELAYED SWEEP GENERATOR

The Delayed Sweep Generator produces a sawtooth voltage that is amplified by the Horizontal Amplifier circuits to provide a delayed sweep crt display. The sawtooth output voltage is generated on command of the Delayed Trigger Generator. The Delayed Sweep Generator also produces a Delayed Sweep Gate pulse, coincident with the time that the Delayed Sweep Generator runs, to be processed by the Sweep Gate Out circuit and the oscilloscope for crt unblanking. Fig. 3-8 shows a detailed block diagram of the Delayed Sweep Generator and the schematic is shown on diagram 5 at the rear of the manual.

Dly'd Swp Start Multi

Q603 and Q608 comprise the Dly'd Swp Start Multi. This circuit is connected as a bistable multivibrator, with Q608 normally conducting and Q603 off.

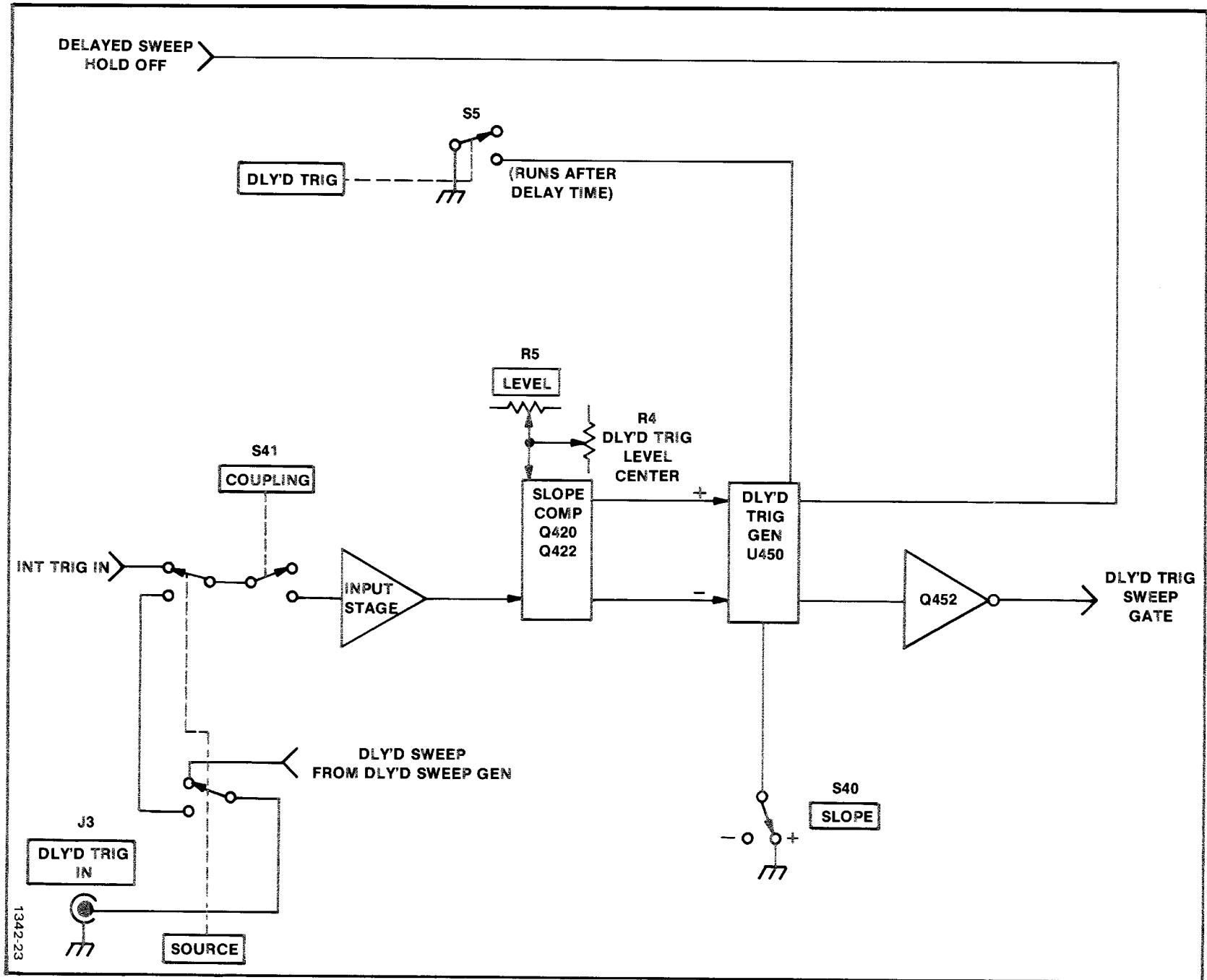
When the DLY'D Sweep Gate switches to its high state, the positive step appears at the base of Q603. This causes the multi to flip, so Q603 is on and Q608 is off, thus causing a positive step through Q610 to pin 1 of U650. Q608 remains in the positive state for the duration of the delay gate. At the end of the delay gate, the Dly'd Swp Start Multi reverts to its original state with Q603 off and Q608 on.

Dly'd Swp Start Control

The Dly'd Swp Start Control circuit includes Q656, Q654, and Q610. This circuit couples a positive gate to pin 1 of U650 (Miller Integrator) to control the period during which a sawtooth is generated.

In all Display Modes except MIXED, Q656 and Q654 are inactive due to the +5 V applied to the base of Q654 (through CR654 and Q280) from the +5 V supply. When the collector of Q608 (Dly'd Swp Start Multi) goes positive, Q610 couples the positive gate to pin 1 of U650, initiating the generation of the delayed sweep sawtooth.

Fig. 3-6. Delayed Trigger Generator Block Diagram (SN B210000 and up 7B53A Only)



1342-23

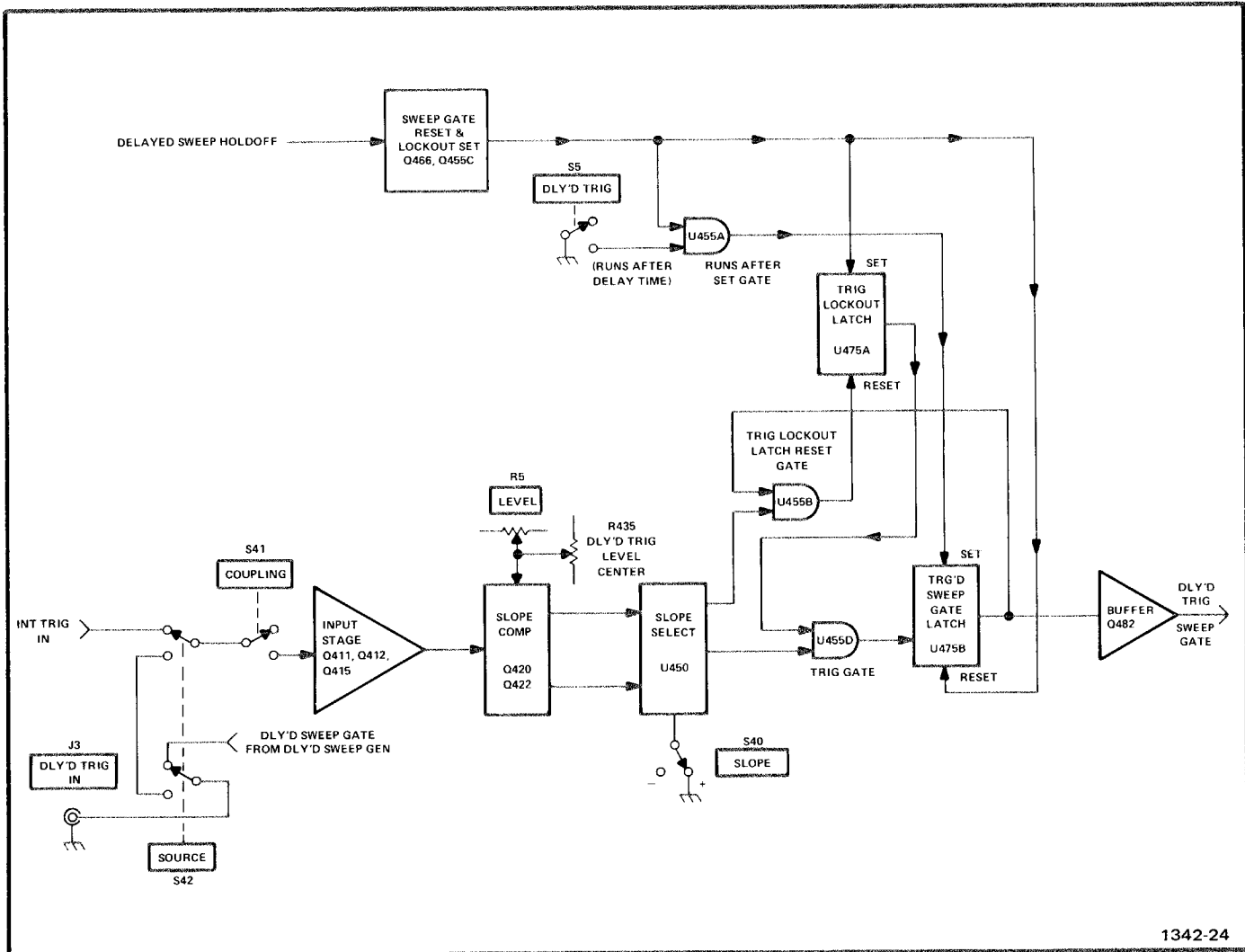


Fig. 3-7. Delayed Trigger Generator Block Diagram (SN B209999 and below).

When operating in the MIXED Display Mode, the anode circuit of CR654 is open. The gate from the Main Swp Start Multi is negative-going at the base of Q654. The resulting current from Q654 forward biases Q610, and a positive gate is coupled to pin 1 of U650.

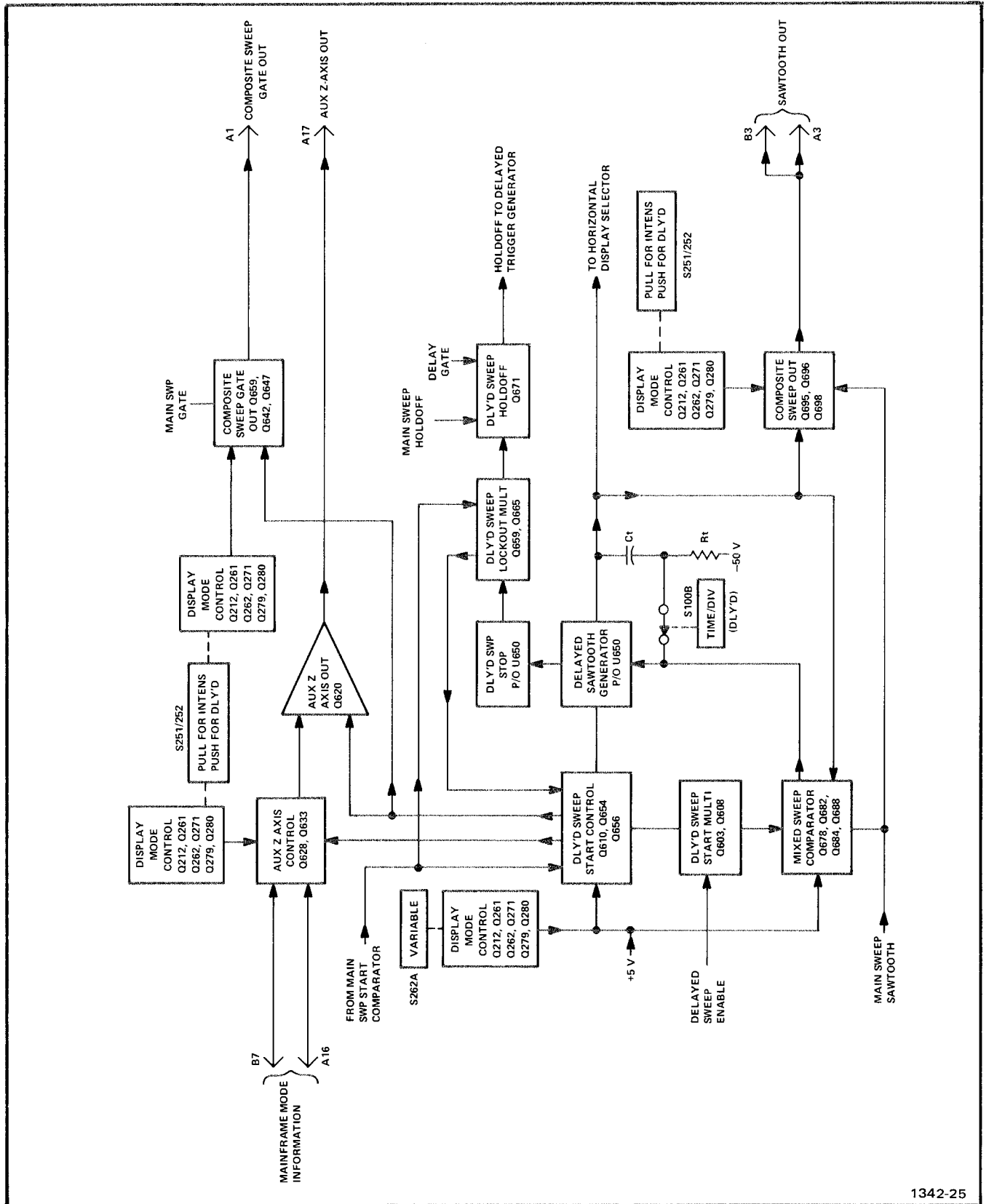
Q603 (Dly'd Swp Start Multi) is biased off and Q678 is on. In this condition, U650, Q678, Q684, and Q688 form an operational amplifier. The negative-going ramp at the collector of Q684 becomes a positive-going ramp at pin 8 of U650, running at the main sweep rate.

Mixed Swp Comparator

Q678, Q682, Q684, and Q688 comprise the Mixed Swp Comparator circuit. This circuit determines whether U650 is running at the main sweep or delayed sweep rate.

When the VARIABLE control is pulled for MIXED, Q682 is forward biased. The main sweep sawtooth at the emitter (and thus, the collector) of Q682 is a positive-going ramp. This causes a ramp of increasing current through Q684. During the time that a Delay Gate is not being generated,

When the Delay Gate is generated, the Delayed Trigger Generator forward biases Q603. The collector current through R684 reverse biases Q678, opening the operational amplifier loop. U650 is released to run at the delayed sweep rate. Therefore, the sawtooth at pin 8 of U650 will first run at the main sweep rate and then change to the delayed sweep rate when the Delay Gate is generated.



1342-25

Fig. 3-8. Delayed Sweep Generator Block Diagram.

Dly'd Swp Stop

Pins 4, 5, and 6 of U650 (plus external circuitry) constitute the Dly'd Swp Stop circuit. The setting of the Dly'd Swp Length adjust (R652) determines the point on the delayed sweep sawtooth at which pin 4 of U650 goes positive.

Dly'd Swp Lockout Multi and Dly'd Swp Holdoff

The operation of the Dly'd Swp Lockout and Holdoff circuits is dependent on the following signals:

1. The Dly'd Swp Stop signal (positive-going) at pin 4 of U650.
2. The Main Sweep Holdoff signal (positive-going) by way of R673.
3. The Main Sweep Gate (positive-going) at the base of Q665 through CR662.
4. The Dly Gate at the base of Q671.

Q659 and Q665 form the Dly'd Swp Lockout Multi. When the Dly'd Swp Stop circuit causes pin 4 of U650 to go positive, Q659 turns on and Q665 turns off, coupling a positive-going holdoff pulse to pin G. At the end of the main sweep, the positive going Main Sweep Gate pulse turns on Q665 and its collector falls. But the positive-going main holdoff pulse through R673 keeps pin G positive. When the main sweep holdoff pulse falls, the level at pin G remains positive due to the negative going Dly Gate pulse applied to Q671. After the delay time determined by the TIME/DIV OR DLY TIME switch and the DELAY TIME MULT dial, the Dly Gate pulse rises, Q671 turns off, and the holdoff pulse at pin G goes negative.

When operating in the MIXED Display Mode, the Delayed Sweep Stop signal (positive-going) at pin 4 of U650, turns on Q659. The negative step at its collector turns on Q656 and turns off Q654. The resulting negative level at the collector of Q654 is coupled through emitter follower Q610, thus removing the positive level from pin 1 of U650.

Composite Swp Out

Q695, Q696 and Q698 form the Composite Swp Out circuit. When the TIME/DIV switch is set for MAIN SWP or INTENS, Q696 is forward biased, coupling the main sweep sawtooth to the base of Q698. Q698 is an emitter-follower stage which couples the signal to output terminals A3 and B3.

If DLY'D or MIXED SWP is selected by the TIME/DIV OR DLY TIME switch, Q695 is forward biased and couples the delayed sweep or mixed sweep sawtooth to the base of Q698.

Q696 and Q698 or Q695 and Q698 (depending on TIME/DIV OR DLY TIME setting) are connected as an operational amplifier, providing a high degree of gain stability.

Composite Swp Gate Out

The Composite Sweep Gate Out circuit includes Q642, Q639, and Q647. The output at the collector of Q647 connects to interface connector pin A1 for use in the indicator oscilloscope. In the AMPL position of the TIME/DIV OR DLY TIME switch, connector A1 is set to approximately +4.3 V (via CR201) to unblank the crt.

Q647 serves as the output stage. With the TIME/DIV OR DLY TIME switch set to either MAIN SWP or INTENS, Q642 couples the main sweep gate to the base of Q647. When either DLY'D or MIXED SWP is selected, Q639 is on. The gate signal at the emitter of Q610 (Dly'd Swp Start Control) is coupled to the base of Q647.

Aux Z Axis Control

The Aux Z Axis Control circuit includes Q628 and Q633. This circuit uses the indicator oscilloscope mode and switching levels to determine when the sweep signal from the 7B53A/7B53AN is being displayed on the crt. Information of this type is normally used only when operating the 7B53A/7B53AN in a four plug-in indicator oscilloscope.

Typical levels to cause the Aux Z Axis Control to intensify the crt are +5 V at terminal A16 and -0.6 V at terminal B7. This forward biases Q633, resulting in a positive level at its emitter.

When the 7B53A/7B53AN is used in a three plug-in indicator oscilloscope and the TIME/DIV OR DLY TIME switch is set to INTENS, Q628 is off and Q633 is forward biased.

Aux Z Axis Out

Q620 is the Aux Z-Axis Out stage. The output at connector DZ is connected to pin A17 on the interface connector and then to the Z-axis circuit in the indicator oscilloscope. A reduction in current through Q620 causes the crt trace to brighten.

For this description, assume that the 7B53A/7B53AN is used in a three plug-in indicator oscilloscope.

As described under Aux Z Axis Control, when INTENS is selected by the TIME/DIV OR DLY TIME switch, Q633 is turned on. The positive level at the emitter of Q633

reverse-biases CR635, which reduces conduction of Q620. The positive gate appearing at the emitter of Q610 (Dly'd Swp Start Control) during the delayed sweep further reduces current through Q620, causing the crt trace to intensify beyond the normal level of unblanking.

In all other selections of the TIME/DIV OR DLY TIME switch, Q628 is forward biased through CR285. This turns off Q633, which diverts current through CR635. Q620 is in saturation and the crt trace brightness is now set by the unblanking signal (Sweep Gate).

HORIZONTAL PREAMP 8

The Horizontal Preamp selects the source of the output signal (main or delayed sweep) and supplies an amplified sawtooth signal to the horizontal circuits in the indicator oscilloscope. In addition, this circuit contains the horizontal magnifier circuit and the horizontal positioning network. Fig. 3-9 shows a detailed block diagram of the Horizontal Preamp and the schematic is shown on diagram 8 at the rear of the manual.

Ext Horiz Amp

The Ext Horiz Amp consists of Q734. When the TIME/DIV OR DLY TIME switch is in any setting except AMPL, the +5 V coupled through CR735 to the base of Q734 holds this transistor off. Therefore, any incoming external horizontal signal is blocked. When the TIME/DIV OR DLY TIME switch is set to AMPL, the +5 V is removed from the base of Q734 and the output signal is coupled through R734.

Horiz Display Selector

Q724 and U720A, B, C, D, and E compose the Horiz Display Selector circuitry. Depending upon the setting of the TIME/DIV OR DLY TIME switch, this circuit determines which signal is coupled to the Horiz Out Amp.

When the TIME/DIV OR DLY TIME switch is set to AMPL, U720C is forward biased and couples the signal from the Ext Horiz Amp to the Horiz Out Amp. Simultaneously, +5 V is disconnected from the Display Mode Control circuit, ensuring that no internally

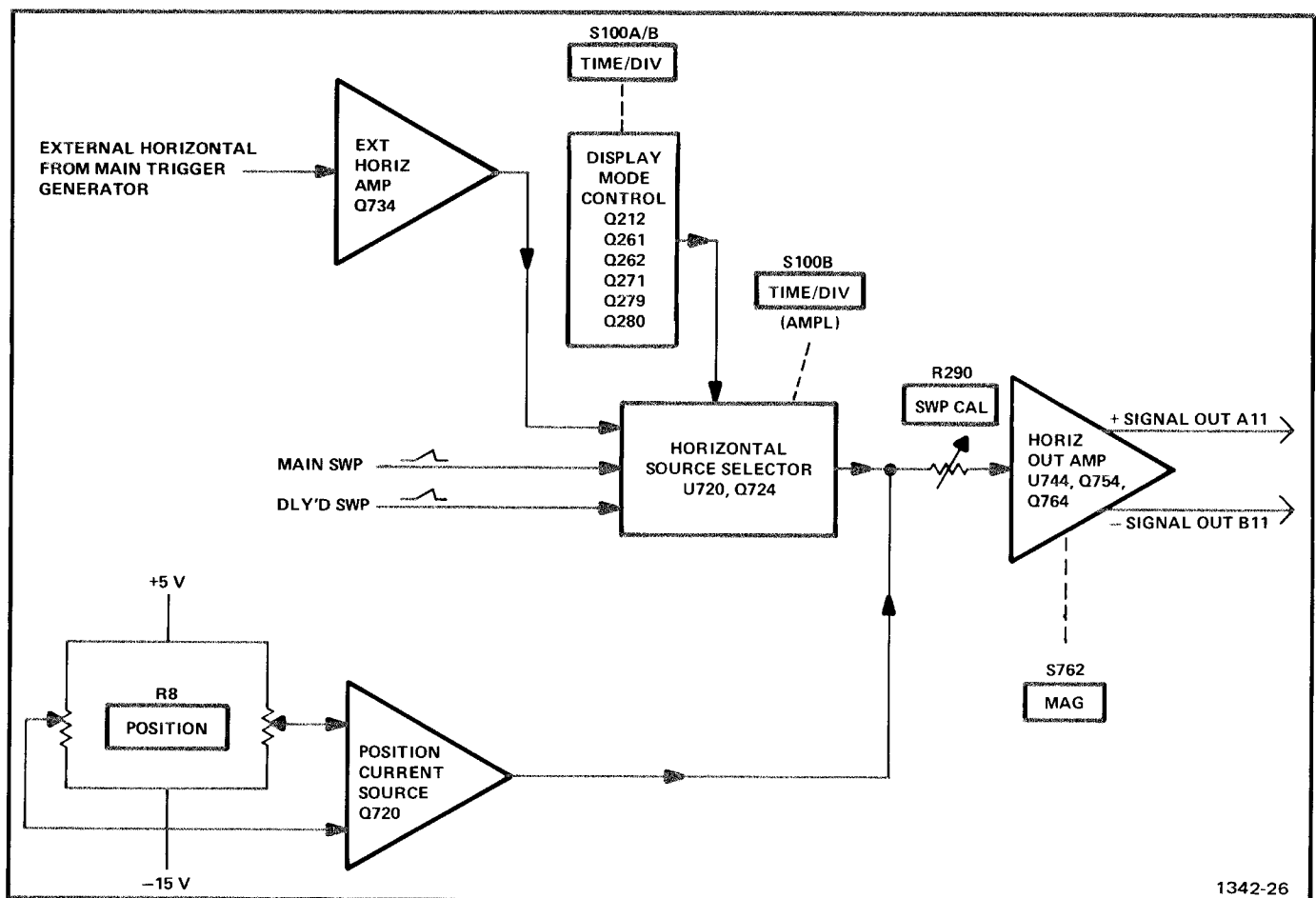


Fig. 3-9. Horizontal Preamp Block Diagram.

Theory of Operation—7B53A/7B53AN

generated sweep signal is coupled through at this time. In all other positions of the TIME/DIV OR DLY TIME switch, +5 V is connected to the Display Mode Control circuit.

When MAIN SWP or INTENS is selected by the TIME/DIV OR DLY TIME switch, +5 V is applied to the anode of CR283. This forward biases U720A, which couples the main sweep sawtooth to the Horiz Out Amp. Q724 is also forward biased so that any signal developed by the Delayed Sweep Generator is by-passed to ground (via the -15 V supply). Any output from the Ext Horiz Amp is coupled to ground through U720D.

When operating in the DLY'D SWP or MIXED Display Mode, +5 V is applied to the base of U720B through CR265. This forward-biases U720B, which couples the delayed sweep or the mixed sweep signal to the Horiz Out Amp. U720E is also forward biased, coupling the main sweep signal to ground.

Position Amp

The POSITION control R8 sets the bias on Q720, thus setting the dc current coupled to the Horiz Out Amp.

Horiz Out Amp

The Horiz Out Amp includes Q754, Q764, and U744A, B, C, and D. U744B and U744C are connected as an operational amplifier, with R_f being R768 and R_i the Swp Cal Adjust, R290.

U744C and U744D form a paraphase amplifier. This stage converts the single-ended input signal to a push-pull output signal, which is necessary to drive the horizontal output stage in the indicator oscilloscope.

This stage also provides the X10 magnification and Mag Gain adjustment. When the MAG X10 button is out, R761 and R762 are connected in parallel with R759 and R766, decreasing the emitter degeneration of the stage. This increases gain of the stage 10 times. The Mag Gain adjust is set to provide a calibrated gain when magnified.

Q754 and U744A set the operating bias for the output stage. Q764 serves as a constant-current source for U744C and U744D.

READOUT SWITCHING

The Readout Switching circuit consists of switching resistors that signal the oscilloscope readout system of the time-base unit sweep rate. The switching resistors are selected by the Time/Division and X10 MAG switch settings.

Refer to schematic diagram 7, Readout Switching, at the rear of this manual. The numbers 1, 2, or 5 are selected by resistors R940, R907, and R905 for Channel 1 (main sweep); and by resistors R941, R919, and R917 for Channel 2 (delayed sweep). The number of zeros is selected by R934, R911, and R909 for Channel 1; and by resistors R935, R923, and R921 for Channel 2. The time prefix (milli, micro, nano) is selected by resistors R928, R903, and R901 for Channel 1; and by resistors R929, R915, and R913 for Channel 2. Resistors R927 and R925 select the symbol S (seconds) for Channel 1 and resistors R939 and R926 select the symbol S for Channel 2. When the VARIABLE Time/Division control is in the Un-calibrated position, R931 selects the symbol > (greater than) for Channel 1 and R922 selects the symbol > for Channel 2. When the MAG switch is in the X10 position, R943 is switched out of the circuit for Channel 1 and R944 is switched out of the circuit for Channel 2.

CALIBRATION

Introduction

To ensure instrument accuracy, check the calibration of the 7B53A/7B53AN every 1000 hours of operation, or every six months if used infrequently. Before complete calibration, thoroughly clean and inspect this instrument as outlined in the Maintenance section.

Tektronix Field Service

Tektronix, Inc., provides complete instrument repair and recalibration service at local Field Service Centers and the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

Using This Procedure

General. This section provides several features to facilitate checking or adjusting the 7B53A/7B53AN. These are:

Index. To aid in locating a step in the Performance Check or Adjustment procedure, an index is given preceding Part I—Performance Check and Part II—Adjustment procedure.

Performance Check. The performance of this instrument can be checked without removing the covers or making internal adjustments by performing only Part I—Performance Check. This procedure checks the instrument against the tolerances listed in the Performance Requirement column of the Specification Section. Screwdriver adjustments accessible from the outside of the instrument are adjusted as part of the Performance Check procedure. In addition, a cross-reference is provided to the step in Part II—Adjustment, which will return the instrument to correct calibration. In most cases, the adjustment step can be performed without changing control settings or equipment connections.

Before proceeding with installation it is necessary to check the settings of the Variable Selector multi-pin connector (P140) and the Delayed Sweep Gate Out multi-pin connector (P613). The Variable Selector multi-pin connector (P140) determines whether the front-panel VARIABLE control varies main sweep rates, delayed sweep rates, or main sweep holdoff; the Delayed Sweep Gate Out multi-pin connector (P613) determines whether the Delayed Sweep Gate Out signal is connected to the front-panel DLY'D TRIG IN connector (see Fig. 4-1). Refer to General Operating Instructions in this section for VARIABLE control and DLY'D GATE OUT information.

Adjustment Procedure. To return this instrument to correct calibration with the minimum number of steps, perform only Part II—Adjustment. The Adjustment procedure gives the recommended calibration procedure for all circuits in this instrument. Procedures are not given for checks that can be made without removing the covers; see Part I—Performance Check for the procedure for these checks.

Partial Procedure. A partial check or adjustment is often desirable after replacing components, or to improve the adjustment of a portion of the instrument between major recalibrations. To check or adjust only part of the instrument, set the controls as given under Preliminary Control Settings and start with the nearest Equipment Required list preceding the desired portion. To prevent unnecessary recalibration of other parts of the instrument, readjust only if the tolerance given in the CHECK—part of the step is not met. If re-adjustment is necessary, also check the calibration of any steps listed in the INTERACTION—part of the step.

Complete Performance Check/Adjustment. To completely check and adjust all parts of this instrument, perform both Part I and II. Start the complete procedure by adjusting the trigger system as given in the adjustment procedure and follow this with the Performance Check for the same portion (e.g., Trigger System Check). This method ensures that the instrument is both correctly adjusted and performing within all given specifications.

NOTE

All waveforms shown in this section were taken with a TEKTRONIX Oscilloscope Camera System, unless noted otherwise.

TEST EQUIPMENT REQUIRED

General

The following test equipment and accessories, or its equivalent, is required for complete calibration of the 7B53A/7B53AN. Specifications given for the test equipment are the minimum necessary for accurate calibration. Therefore, some of the specifications listed here may be less precise than the actual performance capabilities of the test equipment. All test equipment is assumed to be correctly calibrated and operating within the listed specifications.

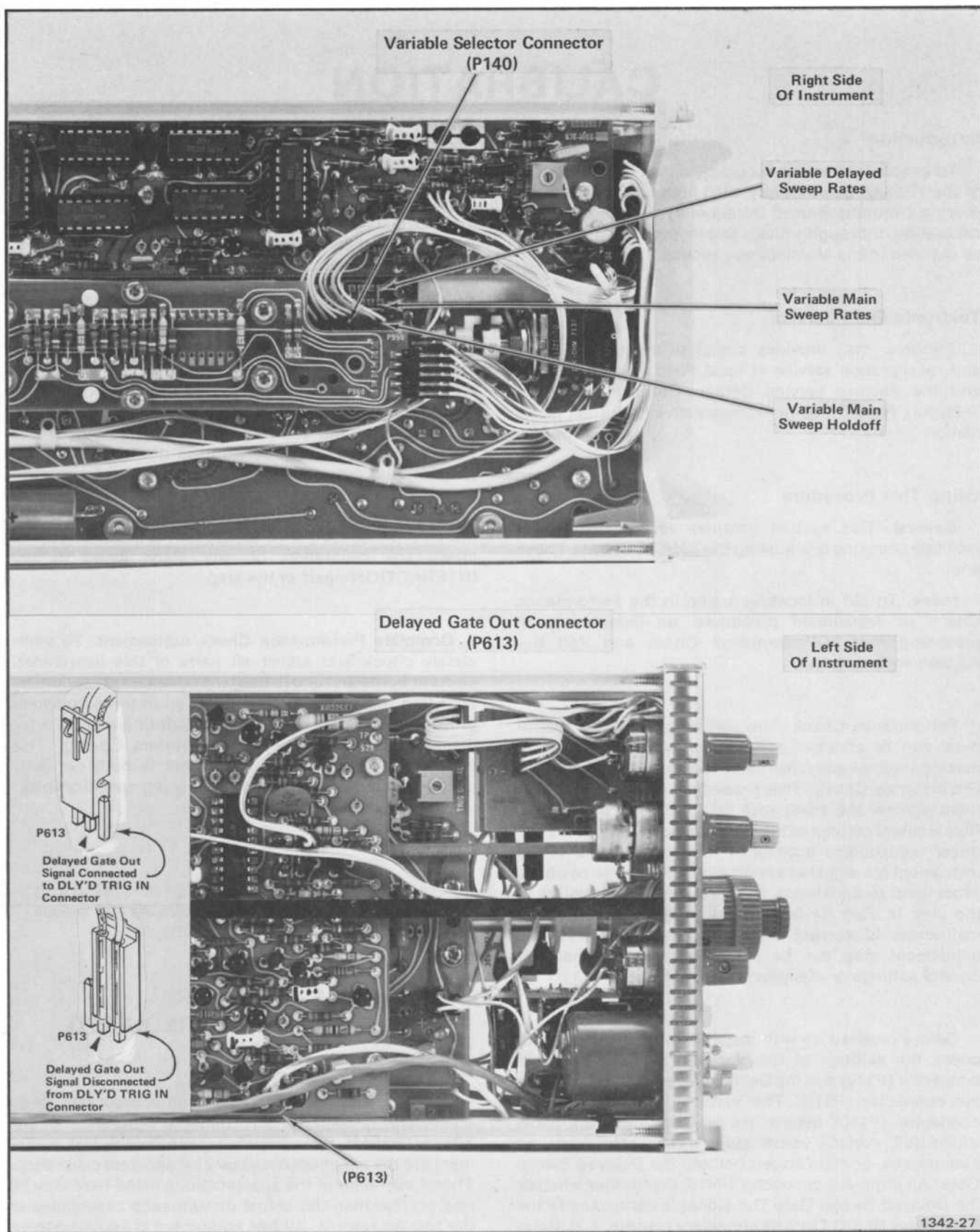


Fig. 4-1. Location of Delayed Gate Out and Variable Selector multi-pin connectors.

The Performance Check and Adjustment procedures are based on this recommended equipment. If other equipment is substituted, control settings or calibration setup may need to be altered to meet the requirements of the equipment used. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Special Calibration Fixtures

Special Tektronix calibration fixtures are used in this procedure only where they facilitate instrument calibration. These special calibration fixtures are available from Tektronix, Inc. Order by part number through your local Tektronix Field Office or representative.

Calibration Equipment Alternatives

All of the listed test equipment, or equivalent, is required to completely check and adjust this instrument. The procedures are based on the first item of equipment given as an example of applicable equipment. When other equipment is substituted, control settings or setup might need to be altered to meet the requirements. If the exact item given as an example in the Test Equipment list is not available, first check the specification column to see if any other equipment might suffice. Then check the Usage column to see what this item is used for. If used for a check or adjustment that is of little or no importance to your measurement requirements, the item and corresponding step(s) can be deleted. For example, if only a Performance Check is to be performed, the square-wave generator can be omitted.

Table 4-1
TEST EQUIPMENT

Description	Minimum Specifications	Usage	Examples of Applicable Test Equipment
1. Oscilloscope	7000-series oscilloscope mainframe. Bandwidth capability of 100 MHz required.	Used throughout procedure to provide display.	a. TEKTRONIX 7603 Oscilloscope. b. Any TEKTRONIX 7000-series oscilloscope with 100 MHz bandwidth (combined with amplifier unit)
2. Amplifier Unit	7A-series amplifier unit. Combined bandwidth of amplifier unit and oscilloscope, 100 MHz.	Used throughout procedure to provide vertical input to oscilloscope system.	a. TEKTRONIX 7A16A Amplifier. b. TEKTRONIX 7A18A Amplifier.
3. Medium-frequency	Frequency range, 50 kHz and 10 MHz to 100 MHz; output amplitude, variable from 15 to 500 mV into 50 Ω .	Internal and external triggering checks. Main and delayed trigger dc balance adjustments.	a. TEKTRONIX Type SG 503 Signal Generator. ^a b. General Radio Model 1310B Oscillator with General Radio Type 274 QBJ Adapter to provide bnc output (can be used for trigger dc balance adjustments only).
4. Low-frequency sine-wave generator	Frequency range, variable from 30 Hz to 2 MHz; output amplitude, variable from 30 mV to 4 V into 50 Ω and to 30 V into 1 M Ω .	Main and delayed triggering checks. Check trigger modes. Check external amplifier gain and bandwidth.	a. TEKTRONIX TYPE FG 504 Generator. ^a
5. Square-wave generator	Amplitude, 500 mV into 50 Ω ; repetition rate, 1 kHz; rise-time, less than 12 ns into 50 Ω .	Main and delayed external trigger input compensation adjustments.	a. TEKTRONIX Type PG 506 Generator. ^a

Table 4-1 (cont)

Description	Minimum Specifications	Usage	Examples
6. Time-mark generator	Marker or sine-wave outputs, from 5 s to 5 ns; marker accuracy, within 0.1%; amplitude at least 0.3 V into 50 Ω.	Sweep timing checks and adjustments. Sweep delay checks and adjustments.	a. TEKTRONIX Type TG 501 Time-Mark Generator. ^a b. TEKTRONIX 2901 Time-Mark Generator.
7. 10X voltage probe	Compatible with 7A-series amplifier unit. Combined risetime of probe, amplifier, and oscilloscope must be less than 3.5 ns.	Check line triggering. External trigger input compensation adjustments. Main and delayed-sweep offset adjustments.	a. TEKTRONIX P6053B Probe. b. TEKTRONIX P6106A.
8. Cable	Impedance, 50 Ω; type, RG-58/U; length, 18 in. connectors, bnc.	Used throughout procedure for signal interconnection.	a. Tektronix Part No. 012-0076-00.
9. Cable (two required)	Impedance, 50 Ω; type, RG-58/U; length 42 in.; connectors, bnc.	Used throughout procedure for signal interconnection.	a. Tektronix Part No. 012-0057-01.
10. Plug-in extender	Rigid extender for 7000-series plug-in units.	Used throughout adjustment procedure to provide access to internal adjustments and test points.	a. Tektronix Part No. 067-0589-00.
11. T connector	Connectors, bnc.	External trigger checks.	a. Tektronix Part No. 103-0030-00.
12. Termination	Impedance, 50 Ω; accuracy, ±2%; connectors, bnc.	Used throughout procedure to terminate 50 Ω coaxial cable with bnc connectors.	a. Tektronix Part No. 011-0049-01.
13. Adapter	Connectors, GR874 to bnc female.	Internal and external triggering checks. Main and delayed-trigger dc balance adjustments. External trigger input compensation adjustments.	a. Tektronix Part No. 017-0063-00.
14. Input RC Normalizer	Time constant, one MΩ times 20 pF; connectors, bnc.	External trigger input compensation adjustments.	a. Tektronix Calibration Fixture 067-0538-00.
15. Attenuator	Impedance, 50 Ω; attenuation; 10X; type, feedthrough; accuracy, ±3%; connectors, bnc.	External trigger input compensation adjustments.	a. Tektronix Part No. 011-0059-02.
16. Screwdriver	Three-inch shaft; 3/32-inch bit.	Used to adjust variable resistors.	a. Xcelite R-3323.
17. Low-capacitance screwdriver	1 1/2-inch shaft.	Used to adjust variable capacitors.	a. Tektronix Part No. 003-0000-00.
18. VOM	0-10 volt scale	Used for sweep offset and trigger null adjustment.	a. TEKTRONIX Type DM 501A Digital Multimeter. ^a b. Simpson 262. c. Tripplet 630NA.

^a Requires TM 500-Series Power Module.

Preliminary Control Settings

Set test equipment and 7B53A/7B53AN controls as follows (for both Performance Check and Adjustment procedure):

7A16A

Position	Midrange
AC-DC-GND	AC
Polarity	+UP
Volts/Div	50 mV
Variable Volts/Div	(CAL-IN)

7603 Oscilloscope

Vert Mode	Left
Trig Source	Vert Mode
Focus	Adjust for well-defined display
Intensity	Midrange
Graticule Illum	As desired

7B53A/7B53AN

MAIN TRIGGERING

SLOPE	(+)
MODE	AUTO
COUPLING	AC
SOURCE	INT
DLY'D TRIG	RUNS AFTER
LEVEL	DLY TIME
SLOPE	+
COUPLING	AC
SOURCE	INT

POSITION	Midrange
MAG	X1
TIME/DIV OR	
DLY'D TIME	20 μ s
DLY'D Time/	20 μ s (press in for
Division	MAIN SWP Display Mode)
VARIABLE	CAL
Variable Selector	MAIN
DELAY TIME MULT	1.00

PART I—PERFORMANCE CHECK

Introduction

The following procedure checks the performance of the 7B53A/7B53AN without removing the side-covers or making internal adjustments. All tolerances given in this procedure are based on the Specification section of the 7B53A/7B53AN Operators Manual.

INDEX TO PART I—PERFORMANCE CHECK

Trigger System Check

	Page
1. Check Main and Delayed Internal Triggering Operation	4-7
2. Check Main and Delayed External Triggering Operation	4-8
3. Check Main and Delayed Internal Trigger Jitter	4-9
4. Check Main and Delayed Low-Frequency Triggering Operation	4-9
5. Check Main Triggering AC High-Frequency Reject Operation	4-10
6. Check Main Triggering AC Low-Frequency Reject Operation	4-10
7. Check Main and Delayed Trigger Level and Slope Operation	4-11
8. Check Main Trigger Modes	4-11
9. Check Line Triggering Operation	4-12

Horizontal System Check

10. Check Main and Delayed Sweep Timing Accuracy and Linearity	4-13
11. Check Main and Delayed Sweep Magnifier Accuracy and Linearity	4-14

12. Check Delay-Time Multiplier Differential Accuracy	4-16
13. Check Delay-Time Jitter	4-17
14. Check Mixed Sweep Operation	4-18
15. Check Main and Delayed Sweep Variable Control Operation	4-18
16. Check External Amplifier Gain	4-19
17. Check External Horizontal Bandwidth	4-19

Preliminary Procedure for Performance Check

NOTE

The performance of this instrument can be checked at any temperature within 0°C to +50°C range unless otherwise stated.

1. Install the 7B53A/7B53AN into the right compartment of the indicator oscilloscope.
2. Install the 7A16A Vertical Amplifier unit into the left vertical compartment.
3. Turn on the oscilloscope and allow at least 20 minutes warmup before proceeding with the Performance Check.
4. Set the equipment controls as given in this section under Preliminary Control Settings.

TRIGGER SYSTEM CHECK

Equipment Required

- | | |
|--------------------------------------|--|
| 1. 7603 Oscilloscope | 6. GR to bnc female adapter |
| 2. 7A16A Amplifier Unit | 7. Bnc T-connector |
| 3. 10X probe | 8. 42-inch 50 Ω bnc cable |
| 4. Medium-frequency signal generator | 9. 18-inch 50 Ω coaxial cable with bnc connectors |
| 5. Low-frequency sine-wave generator | 10. 50 Ω bnc termination |

Control Settings

Set the controls as given under Preliminary Control Settings.

1. Check Main and Delayed Internal Triggering Operation

a. Connect the output of the medium-frequency signal generator to the 7A16A Input with a GR-to-bnc female adapter, 50 Ω coaxial cable, and 50 Ω bnc termination.

b. Change the following control settings:

MAIN TRIGGERING LEVEL	Set for stable main sweep display
TIME/DIV OR DLY TIME	.1 μ s
DLY'D Time/Division	.1 μ s (press in for MAIN SWP Display Mode)

c. Set the medium-frequency signal generator for a 0.3-division display at 10 MHz.

d. Change the MAIN TRIGGERING MODE switch to NORM.

e. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the positive and negative positions of the MAIN TRIGGERING SLOPE switch (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable main sweep display, i.e., TRIG'D light on).

f. Change the following control settings:

MAIN TRIGGERING	
COUPLING LEVEL	AC Set for stable main sweep display
TIME/DIV OR DLY TIME	.2 μ s
DLY'D Time/Division	.1 μ s (press in for DLY'D SWP Display Mode)
DLY'D TRIG LEVEL	DLY'D SWP TRIGGERABLE

g. CHECK—Stable crt display can be obtained with DLY'D TRIG COUPLING switch set to AC and DC for both the + and -- SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary to obtain a stable displayed sweep display).

h. Change the following control settings:

MAIN TRIGGERING	
MODE	AUTO
TIME/DIV OR DLY TIME	.05 μ s
DLY'D Time/Division	.05 μ s
MAG	X10

i. Set the medium-frequency generator for a 1.5-division display at 100 MHz.

j. Set the MAIN TRIGGERING MODE switch to NORM.

k. CHECK—Stable crt display can be obtained with the COUPLING switch for MAIN TRIGGERING set to AC, AC LF REJ, and DC (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

**Calibration—7B53A/7B53AN
Performance Check**

l. Change the following control settings:

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC
LEVEL	Set for a stable main sweep display
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.05 μ s (press in for DLY'D SWP Display Mode)

m. CHECK—Stable crt display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for the + and - SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary to obtain stable display).

n. Disconnect all test equipment.

2. Check Main and Delayed External Triggering Operation

a. Change the following control settings:

MAIN TRIGGERING	
COUPLING	AC
SOURCE	EXT
DLY'D TRIG	
SOURCE	EXT
COUPLING	AC
MAG	X1
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.1 μ s (press in for MAIN SWP Display Mode)

b. Connect the medium-frequency signal generator to the 7A16A Input with a GR-to-bnc female adapter, 50 Ω coaxial cable, and bnc T-connector. Connect the output of the T-connector to the 7B53A/7B53AN MAIN TRIG IN connector with a 50 Ω coaxial cable and 50 Ω bnc termination.

c. Set the medium-frequency signal generator for a two-division display (100 mV) at 10 MHz.

d. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the + and - SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

e. Disconnect the 50 Ω cable and termination from the MAIN TRIG IN connector and connect them to the DLY'D TRIG IN connector.

f. Change the following control settings:

MAIN TRIGGERING	
SOURCE	INT
COUPLING	AC
LEVEL	Set for stable main sweep display
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.05 μ s (press in for DLY'D SWP Display Mode)
DLY'D TRIG LEVEL	RUNS AFTER DLY TIME

g. Set the medium-frequency signal generator for a two-division display (100 mV) at 10 MHz.

h. Rotate the DLY'D TRIG LEVEL control to the DLY'D SWP TRIGGERABLE position.

i. CHECK—Stable crt display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the + and - SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary to obtain a stable delayed sweep display).

j. Disconnect the 50 Ω cable and termination from the DLY'D TRIG IN connector and connect it to the MAIN TRIG IN connector.

k. Change the following control settings:

7B53A/7B53AN

MAIN TRIGGERING	
SOURCE	EXT
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.1 μ s (press in for MAIN SWP Display Mode)
DLY'D TRIG LEVEL	RUNS AFTER DLY TIME

l. Set the 7A16A Volts/Division switch to .1 V and set the medium-frequency signal generator for a five-division display (500 mV) at 10 MHz. Rotate the MAIN TRIGGERING LEVEL control for a stable main sweep display.

m. Without changing the output amplitude, increase the output frequency of the generator to 100 MHz.

n. Press and release the MAG switch to X10.

o. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC LF REJ, and DC for both the + and - SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

p. Disconnect the 50 Ω cable and termination from the MAIN TRIG IN connector and connect it to the DLY'D TRIG IN connector.

q. Change the following control settings:

MAIN TRIGGERING	
SOURCE	INT
LEVEL	Set for stable display
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.05 μ s (press in for the DLY'D SWP Display Mode)
MAG	X1

r. Set the medium-frequency signal generator for five divisions (500 mV) at 10 MHz.

s. Without changing the amplitude, increase the output frequency to 100 MHz.

t. Change the following control settings:

MAG	X10
DLY'D TRIG LEVEL	DLY'D SWP TRIGGERABLE

u. CHECK—Stable crt display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the + and - SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary to obtain a stable delayed sweep display).

v. Disconnect all test equipment.

3. Check Main and Delayed Internal Trigger Jitter

a. Connect the medium-frequency signal generator to the 7A16A Input with a GR-to-bnc female adapter, 50 Ω coaxial cable, and a 50 Ω bnc termination.

b. Change the following control settings:

MAIN TRIGGERING	Set for stable display
LEVEL	(TRIG'D light on)
DLY'D TRIG	
SOURCE	INT
COUPLING	AC
LEVEL	RUNS AFTER DLY TIME

c. Set the medium-frequency signal generator for a 1.5 division display at 75 MHz.

d. Rotate the DLY'D TRIG LEVEL control to DLY'D SWP TRIGGERABLE and rotate control for a stable display.

e. CHECK—crt display for no more than 0.2 division (1 ns) of jitter. Disregard any slow drift.

f. Change the following control settings:

TIME/DIV OR	
DLY TIME	.05 μ s
DLY'D Time/ Division	.05 μ s (press in for MAIN SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for stable display

g. CHECK—crt display for less than 0.2 division (1 ns) of jitter. Disregard any slow drift.

h. Disconnect all test equipment.

4. Check Main and Delayed Low-Frequency Triggering Operation

a. Connect the low-frequency sine-wave generator to the 7A16A Input with a 50 Ω coaxial cable and bnc T-connector. Connect the output of the bnc T-connector to the MAIN TRIG IN connector with a 50 Ω coaxial cable and a 50 Ω bnc termination.

b. Change the following control settings:

TIME/DIV OR	
DLY TIME	10 ms
DLY'D Time/ Division	10 ms (press in for MAIN SWP Display Mode)
MAG	X1

c. Set the low-frequency sine-wave generator for a 0.3-division display at 30 Hz.

**Calibration—7B53A/7B53AN
Performance Check**

d. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC HF REJ, and DC for both the + and - SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

e. Change the following control settings:

MAIN TRIGGERING	
COUPLING	AC
LEVEL	Set for stable main sweep display
TIME/DIV OR	
DLY TIME	10 ms
DLY'D Time/ Division	5 ms (press in for DLY'D SWP Display Mode)
DLY'D TRIG LEVEL	DLY'D SWP TRIGGERABLE

f. CHECK—Stable display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the + and - SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary to obtain a stable delayed sweep display).

g. Change the following control settings:

MAIN TRIGGERING	
MODE	AUTO
SOURCE	EXT
TIME/DIV OR	
DLY TIME	10 ms
DLY'D Time/ Division	10 ms (press in for MAIN SWP Display Mode)
DLY'D TRIG SOURCE	EXT

h. Set the low-frequency sine-wave generator for a one-division display (100 mV) at 30 Hz; then return the MAIN TRIGGERING MODE switch to NORM.

i. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING COUPLING switch set to AC, AC HF REJ, and DC for both the + and - SLOPE (MAIN TRIGGERING LEVEL control may be adjusted as necessary to obtain a stable display).

j. Change the following control settings:

MAIN TRIGGERING	
COUPLING	AC
SOURCE	INT
LEVEL	Set for stable display
TIME/DIV OR	
DLY TIME	10 ms
DLY'D Time/ Division	5 ms (press in for DLY'D SWP Display Mode)

k. Disconnect the 50 Ω cable and termination from the MAIN TRIG IN connector and place it on the DLY'D TRIG IN connector.

l. CHECK—Stable crt display can be obtained with the DLY'D TRIG COUPLING switch set to AC and DC for both the + and - SLOPE (DLY'D TRIG LEVEL control may be adjusted as necessary for a stable display).

5. Check Main Triggering AC High-Frequency Reject Operation

a. Change the following control settings:

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC HF REJ
TIME/DIV OR	
DLY TIME	20 μs
DLY'D Time/ Division	20 μs (press in for MAIN SWP Display Mode)

b. Set the low-frequency sine-wave generator for a 0.3-division display at 50 kHz; then return the MAIN TRIGGERING MODE switch to NORM.

c. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING LEVEL control.

d. Without changing the output amplitude, set the low-frequency sine-wave generator to 1 MHz.

e. Press and release MAG switch to X10 position.

f. CHECK—Stable crt display cannot be obtained at any setting of the MAIN TRIGGERING LEVEL control.

6. Check Main Triggering AC Low-Frequency Reject Operation

a. Change the following control settings:

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC LF REJ
MAG	X1

b. Set the low-frequency sine-wave generator for a 0.3-division display at 30 kHz; then return the MAIN TRIGGERING MODE switch to NORM.

c. CHECK—Stable crt display can be obtained with the MAIN TRIGGERING LEVEL control.

d. Without changing the output amplitude, set the low-frequency sine-wave generator to 60 Hz.

e. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 2 ms (MAIN SWP Display Mode).

f. CHECK—Stable crt display cannot be obtained at any setting of the MAIN TRIGGERING LEVEL control.

7. Check Main and Delayed Trigger Level and Slope Operation

a. Change the following control settings:

7A16A

Volts/Div 1 V

7B53A/7B53AN

MAIN TRIGGERING	
MODE	AUTO
COUPLING	DC
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	
Division	.5 ms (press in for DLY'D SWP Display Mode)
DLY'D TRIG	
LEVEL	RUNS AFTER DLY TIME

b. Remove the 50 Ω termination from the 7B53A/7B53AN DLY'D TRIG IN connector; then reconnect the cable.

c. Set the low-frequency sine-wave generator for the three-divisions of 1 kHz signal.

d. Rotate the DLY'D TRIG LEVEL control to the DLY'D SWP TRIGGERABLE position.

e. CHECK—Rotate the DLY'D TRIG LEVEL control throughout its range and check that display can be triggered at any point along the positive slope of the waveform. Check that no display exists when the LEVEL control is rotated to either extreme.

f. Set the DLY'D TRIG SLOPE switch to —.

g. CHECK—Rotate the DLY'D TRIG LEVEL control throughout its range and check that display can be triggered at any point along the negative slope of the

waveform (indicates DLY'D TRIG LEVEL control range at least + and -1.5 V). Check that no display exists when the LEVEL control is rotated to either extreme.

h. Change the following control settings:

MAIN TRIGGERING

MODE	NORM
SOURCE	EXT
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	
Division	1 ms (press in for MAIN SWP Display Mode)

i. Disconnect the cable from the DLY'D TRIG IN connector and connect it to the MAIN TRIG IN connector.

j. CHECK—Rotate the MAIN TRIGGERING LEVEL control and check that all levels can be selected as the main sweep trigger point for both the + and - SLOPE (indicates MAIN TRIGGERING LEVEL control range of at least + and -1.5 V). Check that no display exists when the LEVEL control is rotated to either extreme.

k. Change the following control settings:

7A16A

Volts/Div 5 V

7B53A/7B53AN

MAIN TRIGGERING	
SOURCE	EXT ÷ 10

l. Set the low-frequency sine-wave generator for six-divisions of 1 kHz signal.

m. CHECK—Rotate the MAIN TRIGGERING LEVEL control and check that all levels can be selected as the main sweep trigger point for both the + and - SLOPE (indicates MAIN TRIGGERING LEVEL control range of at least + and - 15 V). Check that no display exists when the LEVEL control is rotated to either extreme.

n. Disconnect all test equipment.

8. Check Main Trigger Modes

a. Set the following control settings:

7A16A

Volts/div 1 V

**Calibration—7B53A/7B53AN
Performance Check**

7B53A/7B53AN

MAIN TRIGGERING

MODE	AUTO
COUPLING	AC
SOURCE	INT
TIME/DIV OR	
DLY TIME	20 μ s
DLY'D Time/ Division	20 μ s (press in for MAIN SWP Display Mode)

b. Connect the low-frequency sine-wave generator to the 7A16A Input with a 50 Ω coaxial cable and 50 Ω bnc termination.

c. Set the low-frequency sine-wave generator for a four-division display at 50 kHz.

d. Rotate the MAIN TRIGGERING LEVEL control for a free-running display.

e. Set the MAIN TRIGGERING MODE switch to NORM.

f. CHECK—Crt for no display.

g. Set the MODE switch to AUTO. Rotate the MAIN TRIGGERING LEVEL control so that the display is just triggered.

h. Set the MAIN TRIGGERING MODE switch to NORM.

i. CHECK—Crt for triggered display.

j. Set the low-frequency sine-wave generator for a four-division display at 500 Hz.

k. Change the following control settings:

TIME/DIV OR	
DLY TIME	2 ms
DLY'D Time/ Division	2 ms (press in for MAIN SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for a stable display (TRIG'D light on)
MODE	SINGLE SWP

l. CHECK—Crt for no display.

m. Press the MAIN TRIGGERING RESET button.

n. CHECK—Crt for one sweep as RESET button is pressed (Intensity control on the indicator oscilloscope may need to be varied in order that a single sweep display can be observed).

o. Remove the signal from the 7A16A Input, then press the RESET button.

p. CHECK—Crt for no display and READY light on.

q. Reconnect the signal to the 7A16A input.

r. CHECK—That one sweep occurs as the signal is applied to the 7A16A and that the READY light is out after the completion of that sweep.

s. Disconnect all test equipment.

9. Check Line Triggering Operation

a. Connect the 10X probe to the 7A16A Input.

b. Change the following control settings:

7A16A

Volts/Div 5 V

7B53A/7B53AN

MAIN TRIGGERING

SOURCE	LINE
MODE	NORM
TIME/DIV OR	
DLY TIME	5 ms
DLY'D Time/ Division	5 ms (press in for MAIN SWP Display Mode)

c. Connect the X10 probe tip to the same line-voltage source which is connected to the oscilloscope.

d. CHECK—For a stable crt display that is triggered on the correct slope.

e. Disconnect all test equipment.

HORIZONTAL SYSTEM CHECK

Equipment Required

- | | |
|-------------------------|--------------------------------------|
| 1. 7603 Oscilloscope | 4. Low-frequency sine-wave generator |
| 2. 7A16A Amplifier Unit | 5. 42-inch 50 Ω cable |
| 3. Time-mark generator | 6. 50 Ω bnc termination |

Control Settings

Set the controls as given under Preliminary Control Settings.

NOTE

The tolerances given in steps 10 and 11 are for an ambient temperature range of +15°C to +35°C. If outside this range, see Specifications in Section 1.

10. Check Main and Delayed Sweep Timing Accuracy and Linearity

a. Connect the marker output of the time-mark generator to the 7A16A Input with the 50 Ω coaxial cable and 50 Ω bnc termination.

b. Change the following control settings:

7A16A	
Volts/Div	.5 V
7B53A/7B53AN	
MAIN TRIGGERING	
MODE	NORM
LEVEL	Set for stable display (TRIG'D light on)

c. CHECK—Using the TIME/DIV OR DLY TIME switch settings and the time-mark generator settings given in Table 4-2, that the main sweep timing over the middle eight graticule divisions is within the tolerances in Table 4-2.

d. CHECK—Using the time-mark generator settings and the TIME/DIV OR DLY TIME and DLY'D Time/Division switch settings given in Table 4-3, that the delayed sweep timing over the middle eight graticule divisions is within the tolerances in Table 4-3.

Table 4-2

MAIN SWEEP TIMING

NOTE

Main sweep timing must be checked when operating in the MAIN SWP or INTEN Display Modes.

7B53A/7B53AN TIME/DIV or DLY TIME	Time Markers	CRT Display (marker/ division)	Tolerance MAIN SWP
.05 μs	50 ns	1 (cycle)	±0.24 division
.1 μs	.1 μs	1	
.2 μs	.1 μs	2	
.5 μs	.5 μs	1	
1 μs	1 μs	1	
2 μs	1 μs	2	
5 μs	5 μs	1	
10 μs	10 μs	1	
20 μs	10 μs	2	±0.16 division
50 μs	50 μs	1	
.1 ms	.1 ms	1	
.2 ms	.1 ms	2	
.5 ms	.5 ms	1	
1 ms	1 ms	1	
2 ms	1 ms	2	
5 ms	5 ms	1	
10 ms	10 ms	1	±0.24 division
20 ms	10 ms	2	
50 ms	50 ms	1	
.1 s	.1 s	1	
.2 s	.1 s	2	
.5 s	.5 s	1	
1 s	1 s	1	
2 s	1 s	2	
5 s	5 s	1	

**Calibration—7B53A/7B53AN
Performance Check**

**Table 4-3
DELAYED SWEEP TIMING**

NOTE

Delayed sweep timing must be checked when operating in the DLY'D SWP Display Mode.

7B53A/7B53AN		CRT		
TIME/DIV or DLY TIME	DLY'D Time/ Division (press in)	Time Markers	Display (markers/ division)	Tolerance DLY'D SWP
.1 μ s	.05 μ s	50 ns	1 (cycle)	± 0.32 division
.2 μ s	.1 μ s	.1 μ s	1	
.5 μ s	.2 μ s	.1 μ s	2	
1 μ s	.5 μ s	.5 μ s	1	
2 μ s	1 μ s	1 μ s	1	
5 μ s	2 μ s	1 μ s	2	
10 μ s	5 μ s	5 μ s	1	
20 μ s	10 μ s	10 μ s	1	
50 μ s	20 μ s	10 μ s	2	
.1 ms	50 μ s	50 μ s	1	
.2 ms	.1 ms	.1 ms	1	
.5 ms	.2 ms	.1 ms	2	
1 ms	.5 ms	.5 ms	1	
2 ms	1 ms	1 ms	1	
5 ms	2 ms	1 ms	2	
10 ms	5 ms	5 ms	1	
20 ms	10 ms	10 ms	1	
50 ms	20 ms	10 ms	2	
.1 s	50 ms	50 ms	1	± 0.32 division
.2 s	.1 s	.1 s	1	
.5 s	.2 s	.1 s	2	
1 s	.5 s	.5 s	1	

e. Set the time-mark generator for 1 ms markers.

f. Change the following control settings:

TIME/DIV OR DLY TIME	2 ms
DLY'D Time/ Division	1 ms (press in for DLY'D SWP Display Mode)

g. Position the second marker to the second graticule line.

h. CHECK—Fourth marker within 0.12 division (6%) of the fourth vertical line.

i. Position the third marker to the third vertical line.

j. CHECK—Fifth marker within 0.12 division of the fifth vertical line.

k. Continue this check for each two-division portion of the sweep that is within the center eight division of the graticule.

l. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switches to 1 ms (MAIN SWP Display Mode).

m. CHECK Repeat sweep linearity check given in steps g through k. Check for main sweep linearity within 0.1 division (5%).

n. Calibration—See step 4 of adjustment procedure.

11. Check Main and Delayed Sweep Magnifier Accuracy and Linearity

a. Change the following control settings:

MAG	X10
POSITION	Centered

b. Check—Using the TIME/DIV OR DLY TIME switch and the time-mark generator settings given in Table 4-4, the main sweep magnified timing, excluding the first ten divisions and the last ten division of the total magnified display.

c. Rotate the MAIN TRIGGERING LEVEL control for a stable display. Using the TIME/DIV OR DLY TIME settings, DLY'D Time/Division settings, and time-mark generator settings given in Table 4-5, check the delayed sweep magnified timing, excluding the first ten divisions and the last ten divisions of the total magnified display.

d. Change the following control settings:

TIME/DIV OR DLY TIME	2 ms
DLY'D Time/ Division	1 ms (press in for DLY'D SWP Display Mode)

e. Set the time-mark generator for 0.1 ms markers.

Table 4-4

MAIN SWEEP MAGNIFIER ACCURACY

NOTE

Main sweep magnifier accuracy must be checked when operating in the MAIN SWP or INTEN Display Modes.

7B53A/7B53AN TIME/DIV OR DLY TIME	Time-Mark Generator	Crt Display Markers/Div	Tolerance SWP
0.5 μ s	5 ns	1 (cycle)	\pm 0.28 division
.1 μ s	10 ns	1 (cycle)	
.2 μ s	10 ns	2 (cycles)	
.5 μ s	50 ns	1 (cycle)	
1 μ s	.1 μ s	1	
2 μ s	.1 μ s	2	\pm 0.2 division
5 μ s	.5 μ s	1	
10 μ s	1 μ s	1	
20 μ s	1 μ s	2	
50 μ s	5 μ s	1	
.1 ms	10 μ s	1	
.2 ms	10 μ s	2	
.5 ms	50 μ s	1	
1 ms	.1 ms	1	
2 ms	.1 ms	2	
5 ms	.5 ms	1	
10 ms	1 ms	1	
20 ms	1 ms	2	
50 ms	5 ms	1	
.1 s	10 ms	1	
.2 s	10 ms	2	
.5 s	50 ms	1	
1 s	.1 s	1	
2 s	.1 s	2	
5 s	.5 s	1	

f. Position the second displayed marker to the second vertical line of the graticule.

g. CHECK—Fourth displayed marker is within 0.12 division (6%) of the fourth vertical line.

h. Position the third displayed marker to the third vertical line.

i. CHECK—Fifth displayed marker is within 0.12 division of the fifth vertical line.

Table 4-5

DELAYED SWEEP MAGNIFIER ACCURACY

NOTE

Delayed sweep magnifier accuracy must be checked when operating in the DLY'D SWP Display Mode.

7B53A/7B53AN		Time-Mark Generator	CRT Display Markers/ Division	Tolerance	
TIME/DIV OR DLY TIME	DLY'D Time/ Division (press in)				
.1 μ s	.05 μ s	5 ns	1 (cycle)	\pm 0.36 division	
.2 μ s	.1 μ s	10 ns	1 (cycle)		
.5 μ s	.2 μ s	10 ns	2 (cycles)		
1 μ s	.5 μ s	50 ns	1 (cycle)		
2 μ s	1 μ s	.1 μ s	1		
5 μ s	2 μ s	.1 μ s	2	\pm 0.28 division	
10 μ s	5 μ s	.5 μ s	1		
20 μ s	10 μ s	1 μ s	1		
50 μ s	20 μ s	1 μ s	2		
.1 ms	50 μ s	5 μ s	1		
.2 ms	.1 ms	10 μ s	1		
.5 ms	.2 ms	10 μ s	2		
1 ms	.5 ms	50 μ s	1		
2 ms	1 ms	.1 ms	1		
5 ms	2 ms	.1 ms	2		
10 ms	5 ms	.5 ms	1		
20 ms	10 ms	1 ms	1		
50 ms	20 ms	1 ms	2		
.1 s	50 ms	5 ms	1		\pm 0.36 division
.2 s	.1 s	10 ms	1		
.5 s	.2 s	10 ms	2		
1 s	.5 s	50 ms	1		

j. Continue this check for each two-division portion of the total displayed sweep within the center eight divisions of the graticule.

k. Change the following control settings:

TIME/DIV OR DLY TIME	1 ms
DLY'D Time/ Division	1 ms (press in for MAIN SWP Display Mode)

l. CHECK—Repeat magnified sweep linearity check given in steps f through j. Check for magnified main sweep linearity within 0.1 division (5%).

Calibration—7B53A/7B53AN
Performance Check

12. Check Delay Time Multiplier Differential Accuracy

- a. Set the time-mark generator for 1 ms markers.
- b. Change the following control settings:

MAG	X1
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	10 μ s (press in for
Division	DLY'D SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for stable display
DLY'D TRIG	RUNS AFTER DLY TIME

NOTE

The following steps check delay time multiplier accuracy. Two factors must be determined: the maximum error allowable to be within the specification, and the actual error of the measurement.

- c. Rotate the DELAY TIME MULT dial to 1.00. If necessary, further rotate the dial to place a 1 ms marker on the crt. To provide a reference point, position the 1 ms marker to graticule center with the 7B53A/7B53AN POSITION control (see Fig. 4-2). Note the exact DELAY TIME MULT dial setting.

- d. Rotate the DELAY TIME MULT dial to major division points from the dial setting noted in part c (e.g., if the DELAY TIME MULT noted in part c is 0.90, major division points will be 1.90, 2.90, 3.90 through 8.90). Check and record the position of each time-marker (with respect to the reference point established at graticule center) at each major division over the center eight division. See Fig. 4-2 for error measurement and Fig. 4-3 for typical delay time error figures.

- e. CHECK—Scan the figures recorded in step d for all difference readings over the center eight divisions (see Fig. 4-3). Find the maximum error over any one division measurement. Check that it is within the allowable error (see Fig. 4-4).

Example. Refer to the curve in Fig. 4-4 for the 0.5 s/div to 1 μ s/div delay time range. For any one-division measurement the allowable error is 3.7%. At the same delay time range, for any five-division measurement the allowable error is 1.3%.

- f. CHECK—Scan the figures recorded in step d for difference readings over the center eight divisions of

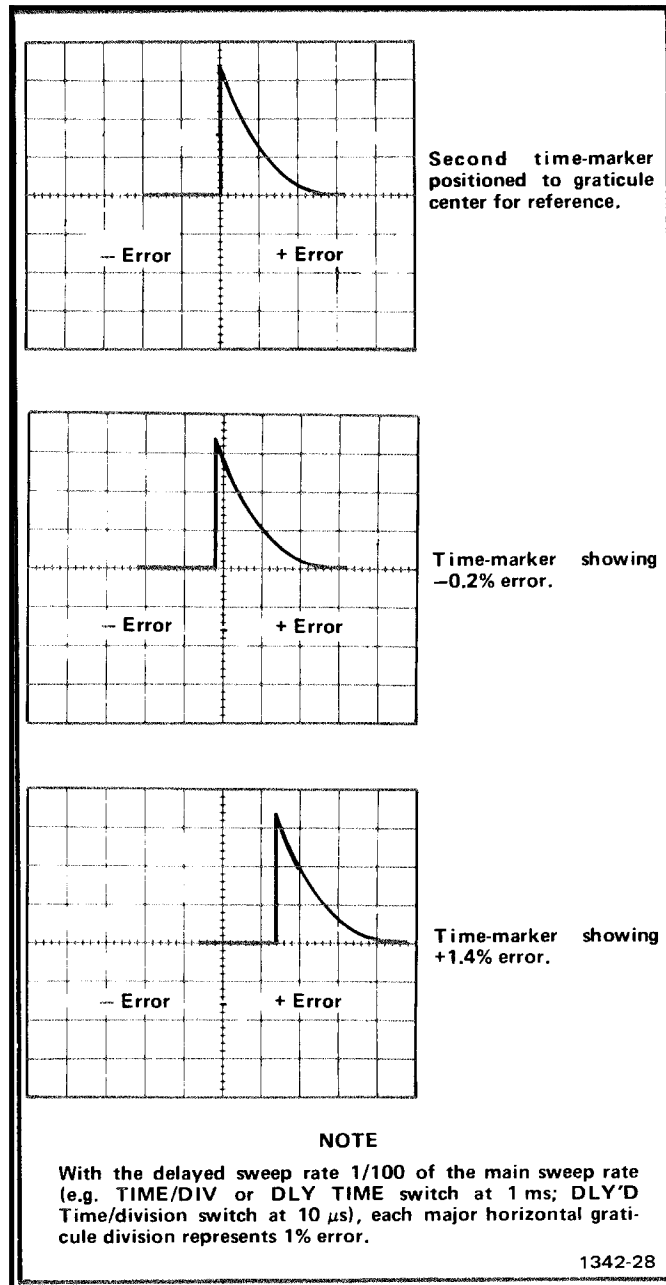
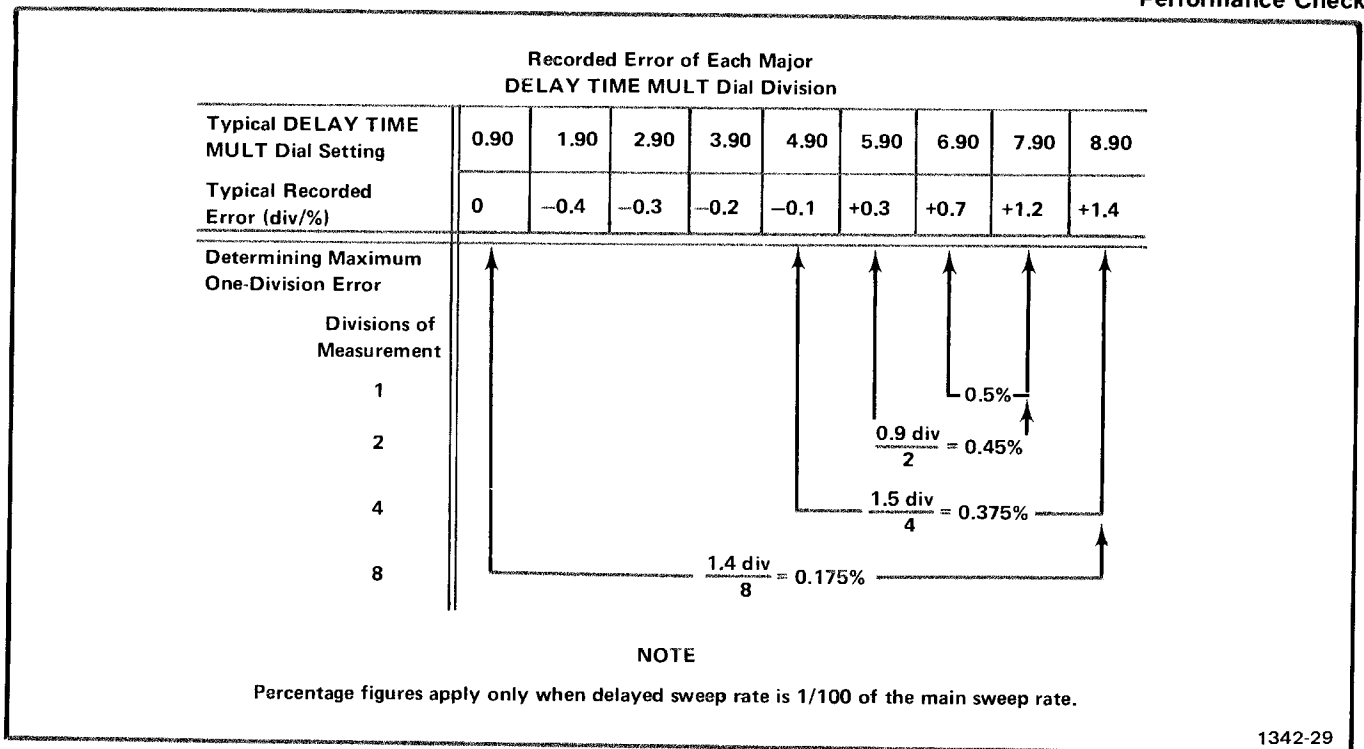


Fig. 4-2. Typical delay time error measurement.

display (see Fig. 4-3). Find the maximum error over any two division measurement, divide by two, and check that it is within the allowable error given in Fig. 4-4.



Percentage figures apply only when delayed sweep rate is 1/100 of the main sweep rate.

Fig. 4-3. Typical Delay Time Error Figures.

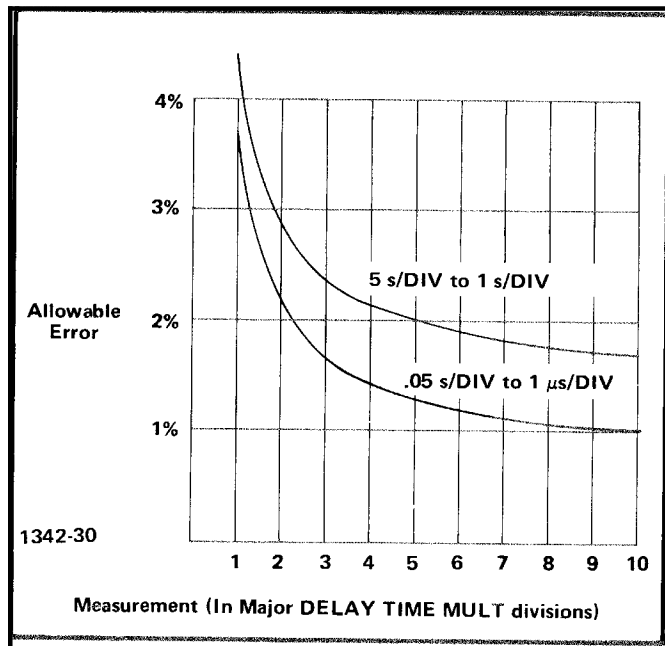


Fig. 4-4. Allowable Delay Time Error.

g. CHECK—Scan the figures recorded in step d for difference readings over the center eight divisions (see Fig. 4-3). Find the maximum error over any four division

measurement, divide by four, and check that it is within the allowable error given in Fig. 4-4.

h. CHECK—Scan the figures recorded in step d for difference readings over the center eight divisions (see Fig. 4-3). Find the maximum error over an eight-division measurement, divide by eight, and check that it is within the allowable error given in Fig. 4-4.

i. Set the time-mark generator for 10 μs markers.

j. Change the following control settings:

TIME/DIV OR	
DLY TIME	10 μs
DLY'D Time/	.1 μs (press in for DLY'D
Division	SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for stable display

k. Repeat steps c through h.

13. Check Delay-Time Jitter

a. Set the time-mark generator for 1 ms markers.

Calibration—7B53A/7B53AN
Performance Check

b. Change the following control settings:

DELAY TIME MULT	1.00
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	.5 μ s (press in for DLY'D
Division	SWP Display Mode)
VARIABLE	CAL

c. Position the pulse near the center of the crt display area with the DELAY TIME MULT dial.

d. CHECK—Jitter in the leading edge of the pulse should not exceed one graticule division (one part in 20,000). Disregard any slow drift.

e. Turn the DELAY TIME MULT dial to about 9.00 and adjust so the pulse is displayed near the center of the crt display area.

f. CHECK—Jitter on the leading edge of the pulse should not exceed one graticule division.

14. Check Mixed Sweep Operation

a. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	1 ms (press in for MAIN
Division	SWP Display Mode)
DELAY TIME MULT	10.00
MAIN TRIGGERING	
LEVEL	Set for stable display

b. CHECK—Timing over center eight graticule divisions. Note the error for part d.

c. Change the following settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	.5 ms (press in for DLY'D
Division	SWP Display Mode)
VARIABLE	Pull out for MIXED
	Display Mode

d. CHECK—Timing over center eight graticule divisions is within 0.16 division (2%) plus the main sweep error noted in part b.

e. Set the DELAY TIME MULT dial to 0.00.

f. Set the time-mark generator for 0.5 ms markers.

g. CHECK—Timing over center eight divisions is within 0.16 division (2%). Position as necessary.

15. Check Main and Delayed Sweep Variable Control Operation

a. Set the time-mark generator for 10 ms markers.

b. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	1 ms (press in for MAIN
Division	SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for stable display

c. Position the markers to the far left and right graticule lines with the POSITION control.

d. Turn the VARIABLE control fully counterclockwise.

e. CHECK—Crt display for equal to or less than four division spacing between markers (indicates adequate range for continuously variable sweep rates between calibrated steps).

f. Change the following control settings:

TIME/DIV OR	
DLY TIME	5 ms
DLY'D Time/	1 ms (press in for DLY'D
Division	SWP Display Mode)
Variable Selector	
(Internal)	Delayed Variable
VARIABLE	CAL

g. Position the markers to the far left and right graticule lines with the POSITION control.

h. Rotate the VARIABLE control fully counterclockwise.

i. CHECK—Crt display for equal to or less than four division spacing between markers (indicates adequate range for continuously variable delayed sweep rates between calibrated steps).

j. Disconnect all test equipment.

16. Check External Amplifier Gain

- a. Change the following control settings:

7A16A	
AC-DC-GND	DC
Volts/Div	.2 V

7B53A/7B53AN	
MAIN TRIGGERING	
MODE	AUTO
SOURCE	EXT
TIME/DIV OR	
DLY TIME	10 μ s
DLY'D Time/ Division	10 μ s (press in for MAIN SWP Display Mode)
MAG	X1

b. Connect the low-frequency sine-wave generator to the 7A16A Input with a 50 Ω coaxial cable and 50 Ω bnc termination.

c. Set the generator for a four-division display (800 mV) at 100 kHz.

d. Disconnect the sine-wave generator from the 7A16A and connect it to the 7B53A/7B53AN MAIN TRIG IN OR AMPL connector.

e. Change the TIME/DIV OR DLY TIME switch to AMPL. Rotate the POSITION control to center the display on the graticule.

f. CHECK—Crt horizontal trace length must be eight divisions ± 0.8 division.

g. Press the EXT $\div 10$ button of the MAIN TRIGGERING SOURCE switch.

h. CHECK—Crt horizontal trace length must be 0.8 divisions with ± 0.08 division.

i. Set the MAG switch to X10. Rotate the POSITION control to center the display on the graticule.

j. CHECK—Crt horizontal trace length must be eight divisions ± 0.8 division.

17. Check External Horizontal Bandwidth

- a. Change the following control settings:

MAIN TRIGGERING	
COUPLING	AC
SOURCE	EXT
MAG	X1

b. Set the sine-wave generator to 1 kHz and adjust the amplitude for a horizontal trace length of eight divisions.

c. Without changing the amplitude, increase the frequency of the sine-wave generator until the horizontal trace length decreases to 5.6 divisions.

d. CHECK—Sine-wave generator frequency must be 2 MHz or greater (upper -3 dB point).

e. Change the MAIN TRIGGERING COUPLING switch to AC LF REJ. Repeat parts b, c, and d.

f. Change the MAIN TRIGGERING COUPLING switch to DC. Repeat parts b, c, and d.

g. Change the MAIN TRIGGERING COUPLING switch to AC HF REJ. Repeat parts b and c.

h. CHECK—Sine-wave generator frequency must be 100 kHz or less (upper -3 dB point).

This completes the Performance Check procedure for the 7B53A/7B53AN. If the instrument has met all tolerances given in this procedure, it is correctly calibrated and within the specified tolerances. Disconnect all test equipment.

NOTE

This procedure does not check the Delayed Sweep Gate output signal as applied to the front panel Dly'd Trig In connector, since this requires removal of one side cover and changing an internal connection. This step is included in the Adjustment procedure since the side covers are already removed. If it is desired to check this step as part of the Performance Check refer to step 11 of the Adjustment procedure.

PART II—ADJUSTMENT

Introduction

The following procedure returns the 7B53A/7B53AN to correct calibration. All limits and tolerances given in this procedure are calibration guides, and should not be interpreted as instrument specifications except as listed in the Performance Requirement column of the Specifications. The actual operation of the instrument may exceed the given limits or tolerances if the instrument meets the Performance Requirements as checked in Part I—Performance Check of this section.

- 8. Adjust Main and Delayed Sweep Length (R564, R652) 4-25
- 9. Adjust Delayed Sweep Start and Delayed Sweep Stop (R576, R572) 4-25
- 10. Adjust Main and Delayed Sweep High-Frequency Timing (C594, C691) 4-26
- 11. Check Delayed Sweep Gate Output 4-27

INDEX TO PART II—ADJUSTMENT

Trigger System Adjustment

	Page
1. Adjust Trigger DC Balance and Main Trigger Level Centering (R72, R333)	4-21
2. Adjust Delayed Trigger Level Centering (R435)	4-22
3. Adjust Main EXternal \pm 10 Compensation (C16) SN B210000 & UP 7B53A Only	4-22
4. Adjust Main and Delayed External Compensation (C401, C301, C16) SN B209999 & BELOW	4-22

Horizontal System Adjustment

5. Adjust Main and Delayed Sweep Offset (R592, R675)	4-24
6. Adjust SWP CAL (front-panel)	4-24
7. Adjust Magnified Sweep Gain (R762)	4-24

Preliminary Procedure for Adjustment

1. Install the Vertical Amplifier unit directly into the left vertical compartment of the oscilloscope.
2. Install the 067-0589-00 plug-in extender into the horizontal compartment.
3. Remove the side covers from the 7B53A/7B53AN and connect the instrument to the plug-in extender.
4. Turn on the oscilloscope and allow at least 20 minutes warmup before proceeding with adjustments.
5. Set the equipment controls as given in this section under Preliminary Control Settings.
6. Refer to Figs. 8-23, 24, and 25, adjustment locations, for appropriate test point (TP) locations.

TRIGGER SYSTEM ADJUSTMENT

Equipment Required

- | | |
|--------------------------------------|--|
| 1. 7603 Oscilloscope | 7. 42-inch 50 Ω coaxial cable |
| 2. 7A16A Amplifier | 8. 18-inch 50 Ω coaxial cable |
| 3. 10X Probe | 9. 50 Ω bnc termination |
| 4. Medium-frequency signal generator | 10. GR to bnc female adapter |
| 5. Square-wave generator | 11. 50 Ω X10 attenuator |
| 6. Plug-in extender | 12. Input RC Normalizer; RC 1 M Ω X 20 pF |
| | 13. VOM |

Control Settings

Set the controls as given under Preliminary Control Settings.

NOTE

See Figs. 8-23, 24, and 25 (located on pull-out page in rear of diagrams section) for location of trigger system adjustments and test points.

1. Adjust Trigger DC Balance and Main Trigger Level Centering (R72, R333)

a. To establish electrical center, set the 7A16A input coupling switch to GND. Connect a VOM across TP50 and TP59 on the 7B53A/7B53AN. Rotate the 7A16A position control for a 0 V reading on the VOM.

NOTE

Do not move the 7A16A position control until part 1 of this step has been completed.

b. Set the 7A16A input coupling to DC and the 7B53A/7B53AN MAIN TRIGGERING COUPLING switch to DC.

c. Connect the medium-frequency signal generator to the 7A16A Input with a GR-to-bnc female adapter, 50 Ω coaxial cable, and 50 Ω bnc termination.

d. Set the medium-frequency signal generator for a one-division display at 50 kHz.

e. Set the MAIN TRIGGERING LEVEL control to (0).

f. CHECK—Crt for sweep trigger point (start of sweep) at the electrical center.

g. ADJUST—R72, Trigger DC Balance, for sweep trigger point at crt electrical center.

h. Change the MAIN TRIGGERING SLOPE switch to — and +. Note the positions of the sweep trigger point with respect to crt electrical center.

i. Change the MAIN TRIGGERING COUPLING switch to AC.

j. CHECK—Sweep trigger points occur at crt electrical center or at points equally above and below crt electrical center of the — and + SLOPE.

k. ADJUST—R333, Main Trigger Level Center, for sweep trigger points equally above and below crt electrical center for the — and + SLOPE.

l. INTERACTION—Repeat the adjustment of R72, Trigger DC Balance, and R333, Main Trigger Level Center, as necessary.

**Calibration—7B53A/7B53AN
Adjustment**

2. Adjust Delayed Trigger Level Centering (R435)

a. Change the following control settings:

TIME/DIV OR	
DLY TIME	20 μ s
DLY'D Time/ Division	10 μ s (press in for DLY'D SWP Display Mode)
DLY'D TRIG LEVEL	RUNS AFTER DLY TIME

b. Rotate the DLY'D TRIG LEVEL control for a stable display with the sweep trigger point at crt electrical center.

c. Change the DLY'D TRIG SLOPE switch to $-$ and $+$. Note the positions of the sweep trigger point with respect to crt electrical center.

d. ADJUST—R435 for sweep trigger points to occur at crt electrical center or at points equally above and below crt electrical center for the $-$ and $+$ DLY'D TRIG SLOPE.

e. Disconnect all test equipment.

**3. Adjust Main EXTERNAL \div 10 Compensation (C16)
SN B210000 & Up 7B53A Only**

a. Connect the output of the square-wave generator to the 7A16A Input with a 20 pF X 1 M Ω Input RC Normalizer.

b. Change the following control settings:

7A16A

Volts/Div	1 V
COUPLING	DC

7B53A/7B53AN

MAIN TRIGGERING	
LEVEL	Set for stable display
COUPLING	DC
MAG	X1
TIME/DIV	.2 ms
SOURCE	EXT \div 10

c. Set the square-wave generator for a five-division display at 1 kHz.

d. Disconnect the RC Normalizer from the 7A16A Input and connect it to the MAIN TRIG IN connector.

e. Connect the 10X probe (properly compensated) from the 7A16A input to TP315.

f. Change the following control settings:

7A16A

Volts/Div	5 mV
COUPLING	AC

g. ADJUST—EXT \div 10 Input Compensation C16 for best square corner on leading edge of waveform (ignore first 2 μ s).

h. Disconnect all test equipment.

4. Adjust Main and Delayed External Compensation (C401, C301, C16) SN B209999 & Below

a. Connect the output of the square-wave generator to the 7A16A Input with a GR-to-bnc female adapter, 50 Ω coaxial cable, 10X attenuator, 50 Ω termination and 20 pF X 1 M Ω Input RC Normalizer.

b. Change the following control settings:

7A16A

Volts/Div	.1 V
-----------	------

7B53A/7B53AN

MAIN TRIGGERING	
LEVEL	Set for stable display
COUPLING	DC
MAG	X1
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/ Division	.5 ms (pull out for INTEN Display Mode)
DLY'D TRIG	
COUPLING	DC
SOURCE	EXT

c. Set the square-wave generator for a five-division display at 1 kHz.

d. Disconnect the RC Normalizer from the 7A16A Input and connect it to the DLY'D TRIG IN connector.

e. Connect the 10X probe (properly compensated) from the 7A16A Input to TP415.

f. Change the following control settings:

7A16A

Volts/Div	5 mV
-----------	------

7B53A/7B53AN

MAIN TRIGGERING	
LEVEL	Set for TRIG'D light on
DLY'D Time/	Press in for DLY'D SWP
Division	Display Mode
DLY'D TRIG	Set for stable display
LEVEL	delayed sweep display

g. ADJUST—Dly'd Ext Comp adjustment C401 for best square corner on leading edge of displayed waveform.

h. Disconnect the 10X probe from TP415 and connect it to TP315. Disconnect the RC Normalizer from the DLY'D TRIG IN connector and connect it to the MAIN TRIG IN connector.

i. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/	1 ms (press in for MAIN
Division	SWP Display Mode)
MAIN TRIGGERING	
SOURCE	EXT
LEVEL	Adjust for stable main
	sweep display

j. ADJUST—Main Ext Comp adjustment C301 for best square corner on leading edge of waveform.

k. Remove the 10X attenuator and connect the 50 Ω termination directly to the Normalizer. Change the MAIN TRIGGERING SOURCE switch to EXT \div 10.

l. ADJUST—Ext \div 10 Input Compensation C16 for best square corner on leading edge of waveform.

m. Disconnect all test equipment.

5. Adjust Main High Frequency Triggering

a. Change the following control settings:

	7A16A
Volts/Div	.1V
	7B53A
MAIN TRIGGERING	
MODE	Auto
COUPLING	AC
SOURCE	INT
MAG	X10
TIME/DIV OR	
DLY TIME	.05 μ s

b. Connect the medium-frequency signal generator to the 7A16A input.

c. Set the medium-frequency signal generator for 100 MHz and an amplitude for 1.5 divisions of display.

d. Set Main Level control to 0.

e. ADJUST—C323 for a stable display, if necessary.

6. Adjust Delayed High Frequency Triggering

a. Change the following control settings:

	7B53A
TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/	.05 μ s (press in for DLY'D
Division	SWP Display Mode)
DLY'D TRIG LEVEL	Approx. 8 O'clock position
DLY'D TRIG	
COUPLING	AC
SOURCE	INT

b. ADJUST—DLY'D TRIG LEVEL for a triggered display.

c. ADJUST—C423 for a stable display, if necessary.

HORIZONTAL SYSTEM ADJUSTMENT

Equipment Required

- | | |
|--------------------------------------|--------------------------------|
| 1. 7603 Oscilloscope | 5. 50 Ω bnc termination |
| 2. 7A16A Amplifier | 6. 10X probe |
| 3. Time-mark generator | 7. Plug-in extender |
| 4. 42-inch 50 Ω coaxial cable | 8. VOM |

Control Settings

Set the controls as given under Preliminary Control Settings.

NOTE

See Figs. 8-23, 24, and 25 (located on pull-out page in rear of diagrams section) for location of horizontal system adjustments and test points.

7. Adjust Main and Delayed Sweep Offset (R592, R675)

- a. Change the following control settings:

7A16A

Volts/Div 5 mV

7B53A/7B53AN

TIME/DIV OR
DLY TIME 1 ms
DLY'D Time/
Division SWP Display Mode)
Mode Normal

- b. Connect a VOM between TP580 and ground.

- c. ADJUST—R592, Main Sweep Offset, for 0 V.

- d. Change the following control settings:

TIME/DIV OR
DLY TIME 2 ms
DLY'D Time/
Division 1 ms (press in for DLY'D
SWP Display Mode)

- e. Move the test lead from TP580 to TP690.

- f. ADJUST—R675, Delayed Sweep Offset, for 0 V.

- g. INTERACTION—Check step 7.

- h. Disconnect all test equipment.

8. Adjust SWP CAL (front-panel)

- a. Connect the marker output of the time-mark generator to the 7A16A Input with the 50 Ω coaxial cable and 50 Ω bnc termination.

- b. Set the time-mark generator for 1 ms markers.

- c. Change the following control settings:

7A16A

Volts/Div .5 V

7B53A/7B53AN

MAIN TRIGGERING Set for stable main
LEVEL sweep display
TIME/DIV OR
DLY TIME 1 ms
DLY'D Time/
Division 1 ms (press in for MAIN
SWP Display Mode)
Mode Auto

- d. CHECK—Crt display for one marker each division between the second and tenth graticule lines (position the display as necessary).

- e. ADJUST—Front-panel SWP CAL control (R290) for one marker per division. The second and tenth markers must coincide exactly with their respective graticule lines (reposition the display slightly with the horizontal POSITION control, if necessary).

9. Adjust Magnified Sweep Gain (R762)

- a. Set the time-mark generator for 0.1 ms markers.

- b. Press and release the MAG switch to X10 (increase the oscilloscope intensity as necessary).
- c. CHECK—Crt display for one marker per division between the second and tenth graticule lines.
- d. ADJUST—Mag Gain control R762 for one marker per division. The second and tenth markers must coincide exactly with their respective graticule lines (position the display as necessary with the horizontal POSITION control).

10. Adjust Main and Delayed Sweep Length (R564, R652)

- a. Set the time-mark generator for 0.1 and 1 ms markers. Press MAG switch to X1.
- b. Rotate the MAIN TRIGGERING LEVEL control for a triggered display. Rotate the POSITION control to position the eleventh 1 ms marker at the center vertical graticule line (see Fig. 4-5).

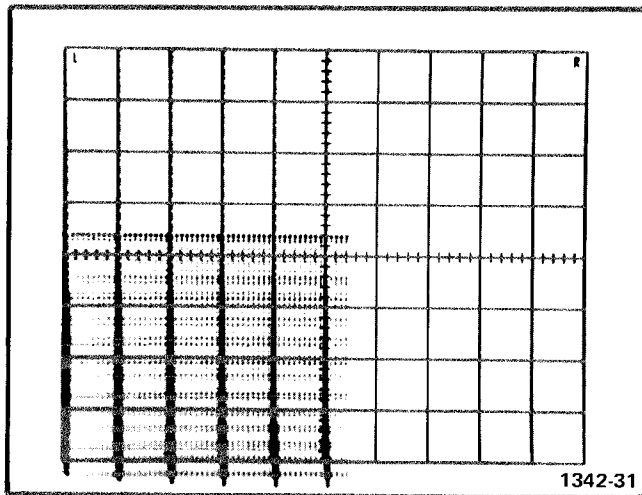


Fig. 4-5. Typical CRT display when checking sweep length.

- c. CHECK—Crt display for sweep length of 10.4 divisions within 0.3 division, as shown by 0.1 to 0.7 division of display to the right of the center vertical graticule line (see Fig. 4-5).

- d. ADJUST—Main Swp Length, R564 for four 0.1 ms markers to the right of the center vertical graticule line.

- e. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/ Division	.1 ms (press in for DLY'D SWP Display Mode)
MAIN TRIGGERING	
LEVEL	Set for TRIG'D light on
DLY'D TRIG LEVEL	DLY'D SWP TRIGGERABLE

- f. Set the time-mark generator for 0.1 ms and 10 μs markers.

- g. Rotate the DLY'D TRIG LEVEL control for a stable display. Rotate the horizontal POSITION control to position the eleventh 0.1 ms marker to the center vertical graticule line.

- h. CHECK—Crt display for sweep length of 10.4 divisions within 0.3 division, as shown by 0.1 to 0.7 division of display to the right of the center vertical graticule line.

- i. ADJUST—R652, Dly'd Swp Length, for four 10 μs markers to the right of the center vertical graticule line.

- j. INTERACTION—Check step 4.

11. Adjust Delayed Sweep Start and Delayed Sweep Stop (R576, R572)

- a. Set the time-mark generator for 1 ms markers.
- b. Change the following control settings:

7B53A/7B53AN

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/ Division	1 ms (pull out for INTEN Display Mode)
MAIN TRIGGERING	
LEVEL	Set for stable display
DLY'D TRIG LEVEL	RUNS AFTER DLY TIME

NOTE

Coarse adjustments of the Delayed Start and Delayed Stop controls will be made in the INTEN DISPLAY MODE followed by fine adjustment in the DLY'D SWP DISPLAY MODE.

**Calibration—7B53A/7B53AN
Adjustment**

c. CHECK—With the DELAY TIME MULT dial set to 1.00, check that the intensified sweep starts on the second marker (position as necessary).

d. ADJUST—Dly'd Start, R576, to start the intensified sweep on the second marker.

e. CHECK—Rotate the DELAY TIME MULT dial to 9.00 and check that the intensified sweep starts on the tenth marker.

f. ADJUST—Dly'd Stop control R572 to start the intensified sweep on the tenth marker.

g. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/ Division	10 μ s (press in for DLY'D SWP Display Mode)
DELAY TIME MULT	1.00

h. ADJUST—Observe the time-marker and adjust R576 to start the delayed sweep at the bottom of marker (see Fig. 4-6). Use the POSITION control to position the display to the center vertical graticule line. If the marker is not displayed, repeat parts b through d, g, and h.

i. Rotate the DELAY TIME MULT to 9.00. Observe the time-marker and adjust R572 to start the delayed sweep at the bottom of marker (see Fig. 4-6). Use the POSITION control to position the display to the center vertical graticule line. If the marker is not displayed, repeat parts b, e, f, g, and i.

j. INTERACTION—Repeat the adjustment of R572 and R576 as necessary.

12. Adjust Main and Delayed Sweep High-Frequency Timing (C594, C691)

a. Set the time-mark generator for .1 μ s markers.

b. Change the following control settings:

TIME/DIV OR	
DLY TIME	.1 μ s
DLY'D Time/ Division	.1 μ s
MAIN TRIGGERING LEVEL	Set for stable main sweep display

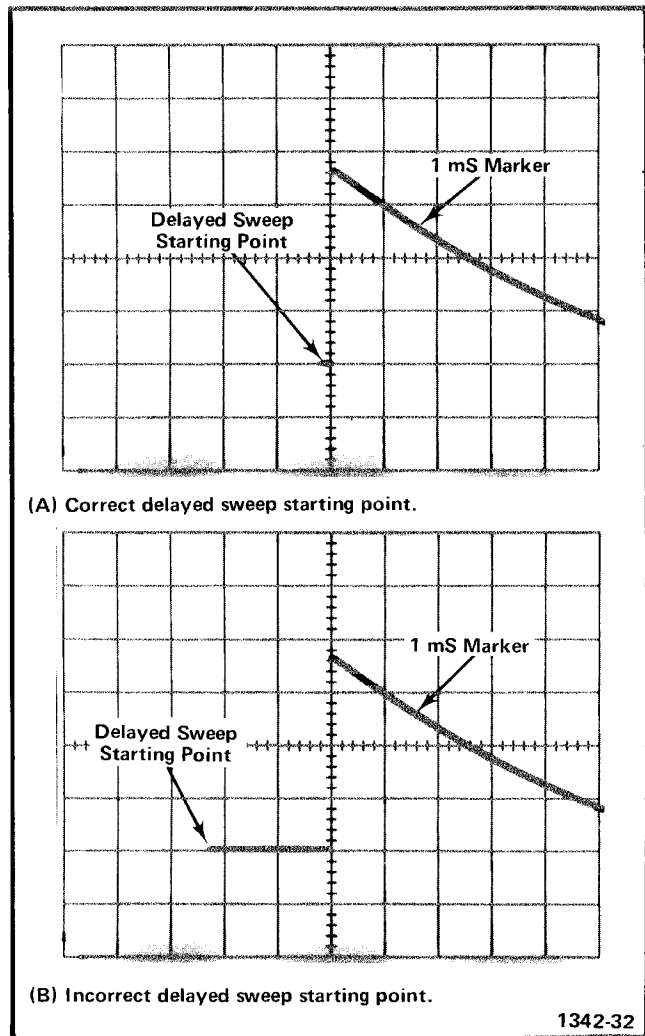


Fig. 4-6. Typical CRT display for adjustment of Dly'd Sweep Start and Dly'd Sweep Stop.

c. Rotate the POSITION control to align the second .1 μ s marker with the second vertical graticule line and the tenth .1 μ s marker with the tenth vertical graticule line.

d. CHECK—Crt display for .1 μ s marker per division within 0.16 division (2%).

e. ADJUST—Main Swp HF Timing control C594 for one marker each division.

f. Change the following control settings:

TIME/DIV OR	
DLY TIME	.2 μ s
DLY'D Time/ Division	.1 μ s (press in for DLY'D SWP Display Mode)
DLY'D TRIG LEVEL	RUNS AFTER DLY TIME

g. Rotate the POSITION control to align the second .1 μ s marker with the second vertical graticule line and the tenth marker with the tenth vertical graticule line.

h. CHECK—Crt display for .1 μ s marker each division within 0.24 division (3%).

i. ADJUST—Dly'd Swp HF Timing control C691 for one marker each division. Use the POSITION control as necessary to align the display.

j. Change the following control settings:

TIME/DIV OR	
DLY TIME	1 μ s
DLY'D Time/ Division	.05 μ s (press in for DLY'D SWP Display Mode)
MAIN TRIGGERING LEVEL	Set for stable display

k. Set the time-mark generator for 1 μ s markers.

l. Rotate the DELAY TIME MULT dial to 1.00. Rotate the dial as necessary to start the delayed sweep in the second time-marker. Note the exact DELAY TIME MULT dial setting.

m. Rotate the DELAY TIME MULT dial exactly 8.00 from the dial setting noted in part k.

n. CHECK—Delayed sweep to start on the tenth time marker.

o. ADJUST—C594, Main HF Timing, to start the delayed sweep on the tenth time-marker.

p. Disconnect all test equipment.

13. Check Delayed Sweep Gate Output

a. Set the controls as given under Preliminary Control Settings.

b. Connect the Delayed Gate Out multi-pin connector, P613, so the signal is connected to the front-panel DLY'D TRIG IN connector. See Fig. 4-1 for connector location.

c. Connect a 42-inch 50 Ω coaxial cable from the DLY'D TRIG IN connector to the 7A16A input.

d. Set the Delayed Triggering SOURCE switch to INT.

e. Set the 7A16A for a deflection factor of one volt/division with DC input coupling.

f. Change the following control settings:

DLY TIME MULT	5.00
TIME/DIV OR	
DLY TIME	1 ms
DLY'D Time/ Division	.1 ms (pull out for INTEN Display Mode)

g. CHECK—The crt display for positive-going rectangular pulse with the baseline level from 0 to 1 V and peak-to-peak amplitude of 3.5 V within 1.4 V. Check that the top of the pulse is intensified (verifies that delayed-gate pulse is same duration as delayed sweep).

h. Disconnect the Delayed Gate Out signal from the DLY'D TRIG IN connector by reversing P613. See Fig. 4-1.

This completes the Adjustment procedure for the 7B53A/7B53AN. Disconnect all test equipment.

MAINTENANCE

Introduction

This section of the manual contains maintenance information for use in preventive maintenance, corrective maintenance, and troubleshooting of the 7B53A/7B53AN.

PREVENTIVE MAINTENANCE

General

Preventive maintenance consists of cleaning, visual inspection, lubrication, etc. Preventive maintenance performed on a regular basis may prevent instrument breakdown and will improve reliability of this instrument. The severity of the environment to which the 7B53A/7B53AN is subjected determines the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

Cleaning

The 7B53A/7B53AN should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause overheating and component breakdown. Dirt on components acts as an insulating blanket and prevents efficient heat dissipation. It may also provide an electrical conduction path.

The covers of the oscilloscope reduce the amount of dust which reaches the interior of the 7B53A/7B53AN. Operation of the system without the oscilloscope covers in place necessitates more frequent cleaning. When the instrument is not in use, it should be stored in a protected location such as a dust-tight cabinet.

CAUTION

Avoid the use of chemical agents which might damage the plastics used in this instrument. Avoid chemicals which contain benzene, toluene, xylene, acetone, or similar solvents.

Exterior. Loose dust accumulated on the outside of the 7B53A/7B53AN can be removed with a soft cloth or small paint brush. The paint brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

Interior. Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high-humidity conditions. The best way to clean the interior is to blow off the accumulated dust with dry low-velocity air. Remove any dirt which remains with a soft paint brush or cloth dampened with a mild detergent and water solution. A cotton-tipped applicator is useful for cleaning in narrow spaces.

Visual Inspection

The 7B53A/7B53AN should be inspected occasionally for such defects as broken connections, broken or damaged circuit boards, improperly seated transistors or relays, and heat-damaged parts.

The corrective procedure for most visible defects is obvious; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of overheating be corrected to prevent a recurrence of the damage.

Semiconductor Checks

Periodic checks of the transistors, FET's, and IC's used in the 7B53A/7B53AN are not recommended. The best indication of performance is the actual operation of the device in the circuit. Performance of the circuits is thoroughly checked during recalibration; substandard semiconductors will usually be detected at that time.

Recalibration

To ensure accurate measurements, check the calibration of this instrument each 1000 hours of operation or every six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. Calibration instructions are given in Section 4.

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See

Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only special antistatic suction type or wick type desoldering tools.

Before using any test equipment to make measurements on static-sensitive components or assemblies, be certain that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

Table 5-1
RELATIVE SUSCEPTIBILITY TO
STATIC DISCHARGE DAMAGE

Semiconductor Classes	Relative Susceptibility Levels ^a
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETS	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

^a Voltage equivalent for levels:

1 = 100 to 500 V 4 = 500 V 7 = 400 to 1000 V (est)
 2 = 200 to 500 V 5 = 400 to 600 V 8 = 900 V
 3 = 250 V 6 = 600 to 800 V 9 = 1200 V

(Voltage discharged from a 100 pF capacitor through a resistance of 100 ohms.)

TROUBLESHOOTING

Introduction

The following information is provided to facilitate troubleshooting of the 7B53A/7B53AN. Information contained in other sections of this manual should be used along with the following information to aid in locating the defective component. An understanding of the circuit operation is very helpful in locating troubles. See the Circuit Operation in Section 3.

Troubleshooting Aids

Diagrams. Circuit diagrams are given on foldout pages in Section 8. The component number and electrical value of each component in this instrument are shown on the diagrams.

Circuit Boards. Fig. 8-2 (located in the Diagrams section) shows the location of the circuit boards within this instrument along with the assembly numbers. The assembly numbers are used on the diagrams to aid in locating the boards. Pictures of the circuit boards are shown in the Diagrams section, on the back of the page opposite the circuit

diagram, to aid the cross-referencing between the diagrams and the circuit-board pictures. Each electrical component on the boards is identified by its circuit number as well as the interconnecting wire or connectors. The circuit boards are also outlined on the diagrams with a black line to show which portions of the circuit are located on a circuit board.

Switch Cam Identification. Switch cam numbers shown on the diagrams indicate the position of the cam in the complete switch assembly. The switch cams are numbered from front to rear.

Diode Color Code. The cathode end of each glass encased diode is identified by a stripe, a series of stripes, or a dot. For most silicon or germanium diodes with a series of stripes, the color code also indicates the type of diode or identifies the Tektronix Part Number using the resistor color-code system (e.g., a diode color coded blue-or-pink brown-gray-green indicates Tektronix Part No. 152-0185-00). The cathode and anode ends of a metal-encased diode can be identified by the diode symbol marked on the body.

Transistor and Integrated Circuit Basing. Fig. 8-1 (located in the diagrams section) illustrates basing configurations for all transistors and integrated circuits used in the 7B53A/7B53AN.

Wiring Color Code. Insulated wire and cable used in the 7B53A/7B53AN is color-coded to facilitate circuit tracing.

Interface Connector Pin Locations. The Interface circuit board couples the 7B53A/7B53AN to the associated oscilloscope. Fig. 5-1 illustrates the locations of pins on the interface connector as shown on the Voltage distribution and Output Connectors schematic in the diagrams section.

Troubleshooting Techniques

This troubleshooting procedure is arranged in an order which checks the simple trouble possibilities first. The first few checks ensure proper connection, operation, and calibration. If the trouble is not located by these checks, the remaining steps aid in locating the defective component. When the defective component is located, it could be replaced following the replacement procedures given under Corrective Maintenance.

1. Check Control Settings. Incorrect control settings can indicate a trouble that does not exist. If there is any question about the correct function or operation of any control, see the Operating Instructions in this manual or

the detailed Operating Instructions in the 7B53A/7B53AN Operators Manual.

2. Check Associated Equipment. Before proceeding with troubleshooting of the 7B53A/7B53AN, check that the equipment used with this instrument is operating correctly. Check that the signal is properly connected and that the probe (if used) is not defective. The indicator oscilloscope and vertical plug-in unit can be checked for proper operation by substituting another time-base unit which is known to be operating properly (preferably another 7B53A/7B53AN or similar unit). If the trouble persists after substitution, the oscilloscope or vertical plug-in unit should be checked.

3. Visual Check. Visually check the portion of the instrument in which the trouble is located. Many troubles can be located by visual indications such as unsoldered connections, broken wires, damaged components.

4. Check Instrument Calibration. Check the calibration of this instrument, or the affected circuit if the trouble exists in one circuit. The apparent trouble may only be a result of misadjustment and may be corrected by calibration. Complete calibration instructions are given in the Calibration section.

5. Isolate Trouble to a Circuit. To isolate a trouble to a particular circuit, note the trouble symptom. The symptom often indicates the circuit in which the trouble is located. For example, if stable triggering can be obtained in INT position of the SOURCE switch and cannot be obtained in the EXT or LINE positions, the External Trigger Preamp or Trigger Source Switching circuits are probably at fault. When trouble symptoms appear, use the front-panel controls and the crt display to isolate the trouble to one circuit. Remember, the amplifier unit or the indicator

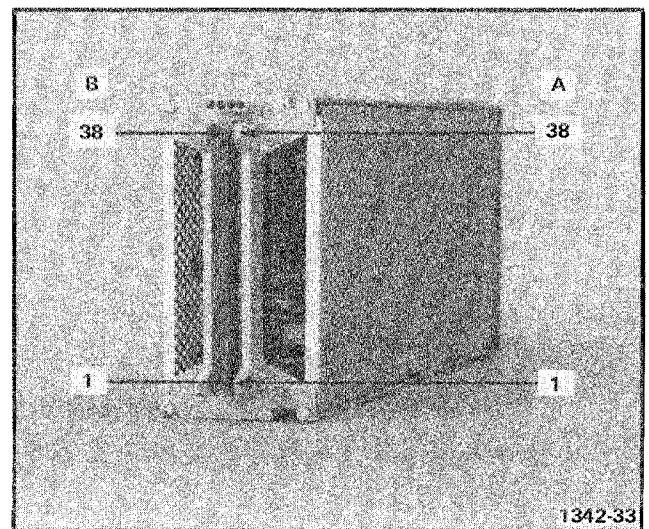


Fig. 5-1. Location of pins on Interface connector.

Maintenance—7B53A/7B53AN

oscilloscope may be responsible for the trouble. When trouble appears in more than one circuit, check all affected circuits by taking voltage and waveform measurements. Once the defective circuit has been located, proceed with steps 6 and 7 to locate the defective component(s).

6. Check Individual Components. The following procedures describe methods of checking individual components in the 7B53A/7B53AN. Components that are soldered in place are best checked by disconnecting one end. This isolates the measurement from the effects of surrounding circuitry.

a. **TRANSISTORS.** The best check of transistor operation is actual performance under operating conditions. If a transistor is suspected of being defective, it can be checked by substituting a new component or one which has been checked previously. However, be sure that circuit conditions are not such that a replacement transistor might also be damaged. If substitute transistors are not available, use a dynamic tester (such as TEKTRONIX Type 576).

b. **INTEGRATED CIRCUITS.** Integrated circuits should not be replaced unless they are actually defective. The best method for checking these devices is by direct substitution with a new component or one which is known to be good. Be sure that circuit conditions are not such that a replacement component might be damaged.

c. **DIODES.** A diode can be checked for an open or for a short circuit by measuring the resistance between terminals with an ohmmeter set to the R X 1k scale. The diode resistance should be very high in one direction and very low when the meter leads are reversed. Do not check tunnel diodes or back diodes with an ohmmeter.

CAUTION

Do not use an ohmmeter scale that has a high internal current. High currents may damage the diode.

d. **RESISTORS.** Resistors can be checked with an ohmmeter. Check the Electrical Parts List for the tolerance of the resistors used in this instrument. Resistors normally do not need to be replaced unless the measured value varies widely from the specified value.

e. **INDUCTORS.** Check for open inductors by checking continuity with an ohmmeter. Shorted or partially shorted inductors can usually be found by

checking the waveform response when high-frequency signals are passed through the circuit. Partial shorting often reduces high-frequency response.

f. **CAPACITORS.** A leaky or shorted capacitor can best be detected by checking the resistance with an ohmmeter on the highest scale. Do not exceed the voltage rating of the capacitor. The resistance should be high after initial charge of the capacitor. An open capacitor can best be detected with a capacitance meter or by checking whether the capacitor passes ac signals.

7. Repair and Readjust the Circuit. If any defective parts are located, follow the replacement procedures given in this section. Be sure to check the performance of any circuit that has been repaired, or that has had any electrical components replaced.

CORRECTIVE MAINTENANCE

General

Corrective maintenance consists of component replacement and instrument repair. Special techniques required to replace components in the instrument are given here.

Obtaining Replacement Parts

Most electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, you should be able to obtain many of the standard electronic components from a local commercial source in your area. Before you purchase or order a part from a source other than Tektronix, Inc., please check the electrical parts list for the proper value, rating, tolerance and description.

NOTE

When selecting replacement parts, it is important to remember that the physical size and shape of a component may affect the performance in the instrument, particularly at high frequencies. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect instrument performance.

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument Type.
2. Instrument Serial Number.

3. A description of the part (if electrical, include circuit number).
4. Tektronix Part Number.

defective connector to your local Tektronix Field Office or representative.

b. Circuit-board Pins

Component Replacement

WARNING

Disconnect the equipment from the power source before replacing components.

Semiconductor Replacement. Semiconductor devices used in this instrument should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement may affect the calibration of this instrument. When replaced, check the operation of that part of the instrument which may be affected.

Replacement devices should be of the original type or a direct replacement. Replace in the same manner as the original. Fig. 8-1 (located in diagram section) shows the lead configurations of the semiconductor devices used in this instrument. When replacing, check the manufacturer's basing diagram for correct basing.

Interconnecting Pin Replacement. Two methods of interconnection are used in this instrument to connect the circuit boards with other boards and components. When the interconnection is made with a coaxial cable, a special end-lead connector plugs into a socket on the board. Other interconnections are made with a pin soldered onto the board. Two types of mating connectors are used for these interconnecting pins. If the mating connector is mounted on a plug-on circuit board, a special socket is soldered into the board. If the mating connector is on the end of a lead, an end-lead pin connector is used which mates with the interconnecting pin. The following information provides the replacement procedure for the various interconnecting methods.

a. Coaxial-Type End-Lead Connectors

Replacement of the coaxial-type end-lead connectors requires special tools and techniques; only experienced maintenance personnel should attempt replacement of these connectors. It is recommended that the cable or wiring harness be replaced as a unit. For cable or wiring harness part numbers, see the Mechanical Parts List. An alternate method is to refer the replacement of the

NOTE

A circuit-board pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Then, unsolder the damaged pin and pull it out of the circuit board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. Then, solder the pin on both sides of the circuit board. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

c. Circuit Board Pin Sockets

The pin sockets on the circuit boards are soldered to the rear of the board. To replace one of these sockets, first unsolder the pin (use a vacuum-type desoldering tool to remove excess solder). Then straighten the tabs on the socket and remove it from the hole in the board. Place the new socket in the circuit board hole and press the tabs down against the board. Solder the tabs of the socket to the circuit board, being careful that solder does not flow into the socket.

NOTE

The spring tension of the pin sockets ensures a good connection between the circuit board and the pin. This spring tension can be destroyed by using the pin sockets as a connecting point for spring-loaded probe tips, alligator clips, etc.

d. End-Lead Pin Connectors

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the associated leads. To replace damaged end-lead pin connectors, remove the old pin connector from the end of the lead and clamp the replacement connector to the lead.

Maintenance—7B53A/7B53AN

Some of the pin connectors are grouped together and mounted in a plastic holder; the overall result is that these connectors are removed and installed as a multi-pin connector. To provide correct orientation of this multi-pin connector when it is replaced, an arrow (or dot) stamped on the circuit board and a matching arrow is molded into the plastic housing of the multi-pin connector. Be sure these arrows are aligned as the multi-pin connector is replaced. If the individual end-lead pin connectors are removed from the plastic holder, note the color of the individual wires for replacement.

Switch Replacement. Two type of switches used in the 7B53A/7B53AN are the pushbutton switches and the cam-type switch. The following special maintenance information is provided.

a. **PUSHBUTTON SWITCHES.** Use the following procedure to replace pushbutton switches:

NOTE

See Mechanical Parts exploded views to aid in pushbutton switch removal.

1. Set the TIME/DIV OR DLY TIME and DLY'D Time/Division switch to AMPL to provide easy access to the setscrew on the clear plastic flange and to facilitate replacement of the Time/Division switch.

2. Loosen the setscrews and remove the LEVEL, SLOPE, POSITION, FINE, VARIABLE, and DLY'D TRIG LEVEL controls. Loosen two setscrews and remove the DLY'D Time/Division knob. Loosen one setscrew and remove the clear plastic flange associated with the TIME/DIV OR DLY TIME switch (setscrew behind the front subpanel).

3. Remove the spring from the 7B53A/7B53AN release latch.

4. Remove front panel to gain access to pushbutton switch mounting screws.

5. Loosen four screws holding the front subpanel to the chassis and the screws holding the switch to be replaced to the front subpanel.

6. Loosen any multi-pin connector(s) associated with the switch being replaced and unsolder leads or components where necessary.

7. When the switch being replaced is clear from external connection, remove the complete switch assembly.

8. To replace the pushbutton switch, reverse the above procedure. Observe the following precautions:

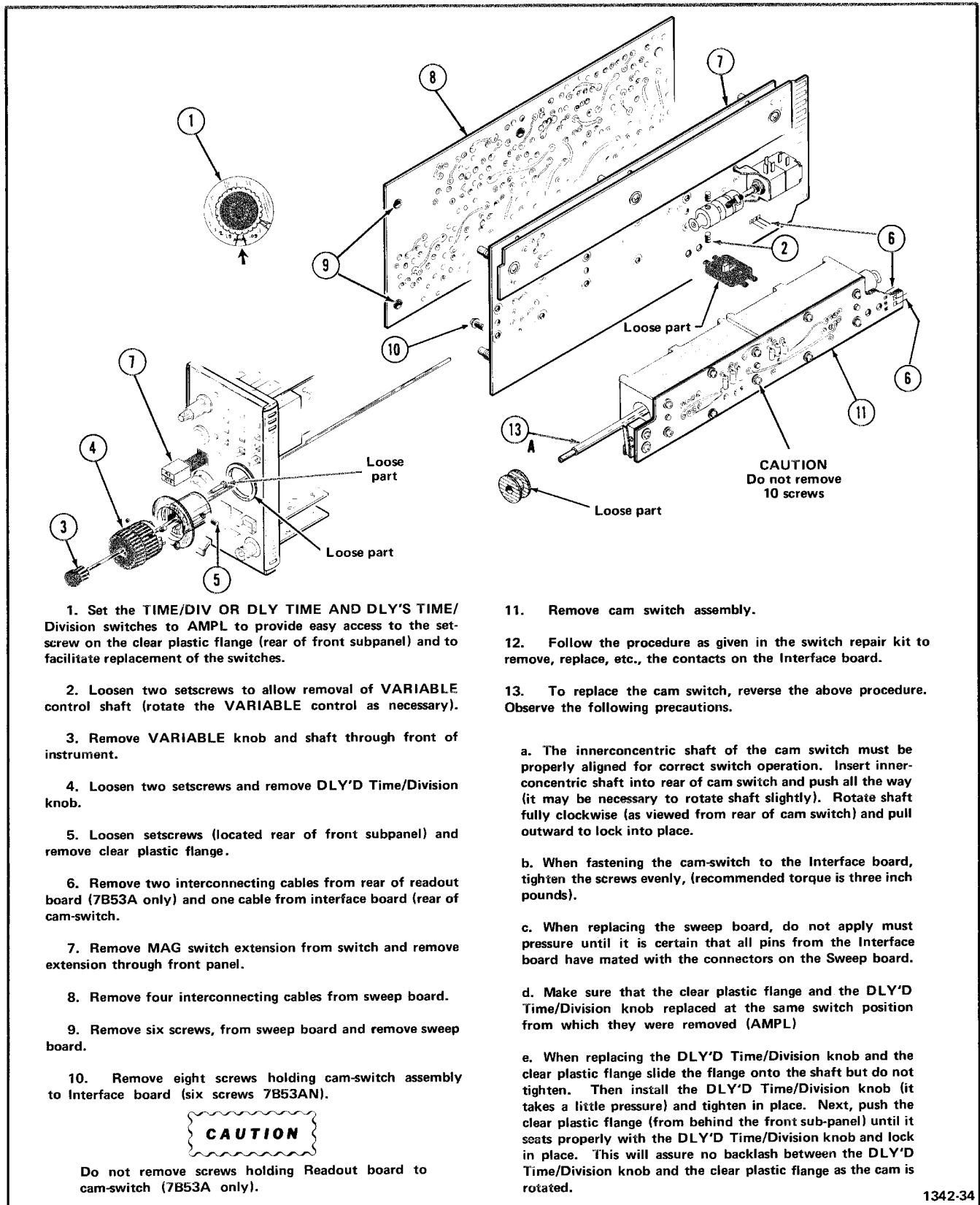
a. Make sure that the clear plastic flange and the DLY'D Time/Division knob are replaced at the same switch position from which they were removed (AMPL).

b. When replacing the DLY'D Time/Division knob and the clear plastic flange, slide the plastic flange onto the shaft but do not tighten. Then install the DLY'D Time/Division knob (it takes a little pressure) and tighten in place. Next, push the clear plastic flange (from behind the front subpanel) until it seats properly with the DLY'D Time/Division knob and lock in place. This will prevent backlash between the clear plastic and the DLY'D Time/Division knob as the cam is rotated.

b. **CAM-TYPE SWITCH.** The cam switch used in the 7B53A/7B53AN consists of two rotating cams (front portion for TIME/DIV OR DLY TIME and rear portion for DLY'D Time/Division) which mate with contacts on an adjacent Interface circuit board. These contacts are activated by lobes on the cams as the switch is rotated. The switch can be disassembled for inspection, cleaning, repair, or replacement, but it is recommended that the switch be removed from the instrument only as a unit. See Fig. 5-2 for special instructions on cam-switch removal.

CAUTION

Repair of the cam switch should be undertaken only by skilled maintenance personnel. Switch alignment and contact spacing must be carefully maintained for proper operation of the switch. The cam switch repair kit (Tektronix Part No. 040-0541-00) contains special alignment tools for use in repairing or replacing the switch contacts. For information or assistance on maintenance of the cam switch, contact your local Tektronix Field Office or representative.



1. Set the TIME/DIV OR DLY TIME AND DLY'S TIME/Division switches to AMPL to provide easy access to the setscrew on the clear plastic flange (rear of front subpanel) and to facilitate replacement of the switches.

2. Loosen two setscrews to allow removal of VARIABLE control shaft (rotate the VARIABLE control as necessary).

3. Remove VARIABLE knob and shaft through front of instrument.

4. Loosen two setscrews and remove DLY'D Time/Division knob.

5. Loosen setscrews (located rear of front subpanel) and remove clear plastic flange.

6. Remove two interconnecting cables from rear of readout board (7B53A only) and one cable from interface board (rear of cam-switch).

7. Remove MAG switch extension from switch and remove extension through front panel.

8. Remove four interconnecting cables from sweep board.

9. Remove six screws, from sweep board and remove sweep board.

10. Remove eight screws holding cam-switch assembly to Interface board (six screws 7B53AN).

CAUTION

Do not remove screws holding Readout board to cam-switch (7B53A only).

11. Remove cam switch assembly.

12. Follow the procedure as given in the switch repair kit to remove, replace, etc., the contacts on the Interface board.

13. To replace the cam switch, reverse the above procedure. Observe the following precautions.

a. The innerconcentric shaft of the cam switch must be properly aligned for correct switch operation. Insert innerconcentric shaft into rear of cam switch and push all the way (it may be necessary to rotate shaft slightly). Rotate shaft fully clockwise (as viewed from rear of cam switch) and pull outward to lock into place.

b. When fastening the cam-switch to the Interface board, tighten the screws evenly, (recommended torque is three inch pounds).

c. When replacing the sweep board, do not apply must pressure until it is certain that all pins from the Interface board have mated with the connectors on the Sweep board.

d. Make sure that the clear plastic flange and the DLY'D Time/Division knob replaced at the same switch position from which they were removed (AMPL)

e. When replacing the DLY'D Time/Division knob and the clear plastic flange slide the flange onto the shaft but do not tighten. Then install the DLY'D Time/Division knob (it takes a little pressure) and tighten in place. Next, push the clear plastic flange (from behind the front sub-panel) until it seats properly with the DLY'D Time/Division knob and lock in place. This will assure no backlash between the DLY'D Time/Division knob and the clear plastic flange as the cam is rotated.

1342-34

Fig. 5-2. Cam Switch Removal.

OPTIONS

Information pertaining to Option 5 can be found in Tektronix manual part number: 070-1471-00.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00213	NYTRONICS COMPONENTS GROUP INC SUBSIDIARY OF NYTRONICS INC	ORANGE ST	DARLINGTON SC 29532
00853	SANGAMO WESTON INC COMPONENTS DIV	SANGAMO RD PO BOX 128	PICKENS SC 29671-9716
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204-2410
01963	CHERRY ELECTRICAL PRODUCTS CORP	3600 SUNSET AVE	WAUKEGAN IL 60087-3214
02111	HAMILTON STANDARD CONTROLS INC SPECTROL DIV	17070 E GALE AVE P O BOX 1220	CITY OF INDUSTRY CA 91749
02114	AMPEREX ELECTRONIC CORP FERROXCUBE DIV	5083 KINGS HWY	SAUGERTIES NY 12477
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
03888	PYROFILM DIV DIV OF KDI ELECTRONICS INC	60 S JEFFERSON RD	WHIPPANY NJ 07981-1001
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008-4229
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
07263	FAIRCHILD SEMICONDUCTOR CORP NORTH AMERICAN SALES	10400 RIDGEVIEW CT	CUPERTINO CA 95014
07716	SUB OF SCHLUMBERGER LTD MS 118 TRW INC	2850 MT PLEASANT AVE	BURLINGTON IA 52601
10389	TRW IRC FIXED RESISTORS/BURLINGTON LICON	1714 N DAMEN AVE	CHICAGO IL 60647-5509
12697	DIV OF ILLINOIS TOOL WORKS INC CLAROSTAT MFG CO INC	LOWER WASHINGTON ST	DOVER NH 03820
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP	500 BROADWAY P O BOX 168	LAWRENCE MA 01841-3002
19647	CADDOCK ELECTRONICS INC	1717 CHICAGO AVE	RIVERSIDE CA 92507-2302
19701	MEPCO/CENTRALAB A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067-0760
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701-3737
31433	UNION CARBIDE CORP ELECTRONICS DIV	HWY 276 SE PO BOX 5928	GREENVILLE SC 29606
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507-2114
33095	SPECTRUM CONTROL INC	2185 WEIGHT ST	ERIE PA 16505
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	370 W TRIMBLE RD	SAN JOSE CA 95131
52648	PLESSEY TRADING CORP PLESSEY OPTOELECTRONICS AND MICROWAVE	1641 KAISER AVE	IRVINE CA 92714-5703
52763	STETTNER ELECTRONICS INC	6135 AIRWAYS BLVD PO BOX 21947	CHATTANOOGA TN 37421-2970
54583	TDK ELECTRONICS CORP	12 HARBOR PARK DR	PORT WASHINGTON NY 11550
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195-4526
56289	SPRAGUE ELECTRIC CO WORLD HEADQUARTERS	92 HAYDEN AVE	LEXINGTON MA 02173-7929
57668	R-OHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
58361	GENERAL INSTRUMENT CORP OPTOELECTRONICS DIV	3400 HILLVIEW AVE	PALO ALTO CA 94304-1319
58854	GTE PRODUCTS CORP LIGHTING PRODUCTS GROUP	60 BOSTON ST	SALEM MA 01970-2147
59660	TUSONIX INC	7741 N BUSINESS PARK DR PO BOX 37144	TUCSON AZ 85740-7144
59821	MEPCO/CENTRALAB A NORTH AMERICAN PHILIPS CO	7158 MERCHANT AVE	EL PASO TX 79915-1207
74970	JOHNSON E F CO	299 10TH AVE S W	WASECA MN 56093-2539

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
75042	IRC ELECTRONIC COMPONENTS PHILADELPHIA DIV TRW FIXED RESISTORS	401 N BROAD ST	PHILADELPHIA PA 19108-1001
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500 MS 53-111	BEAVERTON OR 97707-0001
80031	MEPCO/ELECTRA INC	22 COLUMBIA RD	MORRISTOWN NJ 07960
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601-3632
TK1345	ZMAN AND ASSOCIATES	7633 S 180TH	KENT WA 98032

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
A1	670-2257-00	B010100	B089999	CIRCUIT BD ASSY:INTERFACE (7B53A ONLY)	80009	670-2257-00
A1	670-2257-02	B090000	B209999	CIRCUIT BD ASSY:INTERFACE (7B53A ONLY)	80009	670-2257-02
A1	670-2257-04	B210000		CIRCUIT BD ASSY:INTERFACE (7B53A ONLY)	80009	670-2257-04
A1	670-1863-00	B010100	B019999	CIRCUIT BD ASSY:INTERFACE (7B53AN ONLY)	80009	670-1863-00
A1	670-1863-01	B020000	B089999	CIRCUIT BD ASSY:INTERFACE (7B53AN ONLY)	80009	670-1863-01
A1	670-1863-02	B090000		CIRCUIT BD ASSY:INTERFACE (7B53AN ONLY)	80009	670-1863-02
A2	670-1869-00			CIRCUIT BD ASSY:TRIGGER SOURCE SW	80009	670-1869-00
A3	670-1868-00			CIRCUIT BD ASSY:TRIGGER COUPLING SW	80009	670-1868-00
A4	670-1865-01	B010100	B069999	CIRCUIT BD ASSY:TRIGGER	80009	670-1865-01
A4	670-1865-02	B070000	B209999	CIRCUIT BD ASSY:TRIGGER	80009	670-1865-02
A4	670-1865-04	B210000		CIRCUIT BD ASSY:TRIGGER (7B53A ONLY)	80009	670-1865-04
A4	670-1865-00	B010100	B019999	CIRCUIT BD ASSY:TRIGGER	80009	670-1865-00
A4	670-1865-01	B020000	B069999	CIRCUIT BD ASSY:TRIGGER	80009	670-1865-01
A4	670-1865-02	B070000		CIRCUIT BD ASSY:TRIGGER (7B53AN ONLY)	80009	670-1865-02
A5	670-1867-00			CIRCUIT BD ASSY:TRIGGER MODE SW	80009	670-1867-00
A6	670-1864-00	B010100	B089999	CIRCUIT BD ASSY:SWEEP	80009	670-1864-00
A6	670-1864-01	B090000	B209999	CIRCUIT BD ASSY:SWEEP	80009	670-1864-01
A6	670-1864-02	B210000	B229999	CIRCUIT BD ASSY:SWEEP	80009	670-1864-02
A6	670-1864-03	B230000	B241889	CIRCUIT BD ASSY:SWEEP	80009	670-1864-03
A6	670-1864-04	B241890		CIRCUIT BD ASSY:SWEEP	80009	670-1864-04
A7	670-1866-00	B010100	B209999	CIRCUIT BD ASSY:DELAYED COUPLING	80009	670-1866-00
A7	670-1866-01	B210000		CIRCUIT BD ASSY:DELAYED COUPLING	80009	670-1866-01
A8	670-2258-01	B010100	B179999	CIRCUIT BD ASSY:READOUT (7B53A INCLUDES READOUT AND ACTUATOR)	80009	670-2258-01
A8	670-2258-00	B010100	B179999	CIRCUIT BD ASSY:READOUT (7B53A, READOUT ONLY, SUBPART OF 670-2258-01)	80009	670-2258-00
A8	670-2258-00	B180000	B192519	CIRCUIT BD ASSY:READOUT (7B53A ONLY)	80009	670-2258-00
A8	670-2258-02	B192520	B241159	CIRCUIT BD ASSY:READOUT (7B53A ONLY)	80009	670-2258-02
A8	670-2258-03	B241160		CIRCUIT BD ASSY:READOUT (7B53A ONLY)	80009	670-2258-03
A9	670-2216-00			CIRCUIT BD ASSY:TRIGGER SHIELD	80009	670-2216-00
C2	283-0636-00			CAP, FXD, MICA DI: 36PF, 1.4%, 100V	00853	D155E360G0
C16	281-0092-00			CAP, VAR, CER DI: 9-35PF, 200V	33095	53-717-001 D9-35
C17	281-0526-00			CAP, FXD, CER DI: 1.5PF, +/-0.5PF, 500V	52763	2RDPLZ007 1P500S
C23	281-0549-00			CAP, FXD, CER DI: 68PF, 10%, 500V	52763	2RDPLZ007 68P0KU
C25	281-0601-00			CAP, FXD, CER DI: 7.5PF, +/-0.5PF, 500V	52763	2RDPLZ007 7P500C
C26	281-0628-00			CAP, FXD, CER DI: 15PF, 5%, 500V	52763	2RDPLZ007 15P0JC
C28	283-0068-00			CAP, FXD, CER DI: 0.01UF, +100-0%, 500V	59660	871-533E103P
C41	283-0068-00			CAP, FXD, CER DI: 0.01UF, +100-0%, 500V	59660	871-533E103P
C43	283-0599-00	B010100	B209999	CAP, FXD, MICA DI: 98PF, 5%, 500V	00853	D105F980J0
C43	281-0512-00	B210000		CAP, FXD, CER DI: 27PF, +/-2.7PF, 500V	52763	2RDPLZ007 27P0KC
C51	281-0547-00			CAP, FXD, CER DI: 2.7PF, +/-0.25PF, 500V (7B53A ONLY)	52763	2RDPLZ007 2P70CC
C51	281-0547-00	B020000		CAP, FXD, CER DI: 2.7PF, +/-0.25PF, 500V (7B53AN ONLY)	52763	2RDPLZ007 2P70CC
C52	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C55	281-0523-00	B010100	B209999	CAP, FXD, CER DI: 100PF, 20%, 350V	52763	2RDPLZ007 100PMU
C55	283-0639-00	B210000		CAP, FXD, MICA DI: 56PF, 1%, 100V	00853	D155E560F0
C60	281-0547-00			CAP, FXD, CER DI: 2.7PF, +/-0.25PF, 500V	52763	2RDPLZ007 2P70CC

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
C60	281-0547-00	B020000		(7B53A ONLY) CAP, FXD, CER DI: 2.7PF, +/-0.25PF, 500V	52763	2RDPLZ007 2P70CC
C63	283-0000-00	B010100	B209999	(7B53AN ONLY) CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C63	281-0605-00	B210000		CAP, FXD, CER DI: 200PF, 10%, 500V	59660	301000Y5D201K
C64	281-0518-00			CAP, FXD, CER DI: 47PF, +/-9.4PF, 500V	52763	2RDPLZ007 47POMU
C66	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C68	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C70	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C74	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C82	283-0080-00			CAP, FXD, CER DI: 0.022UF, +80-20%, 25V	59821	2DDU60E223Z
C101	290-0523-00			CAP, FXD, ELCTLT: 2.2UF, 20%, 20V	05397	T368A225M020AS
C103	283-0010-00	B010100	B049999	CAP, FXD, CER DI: 0.05UF, +80-20%, 50V	04222	SR305E503ZAA
C103	283-0341-00	B050000		CAP, FXD, CER DI: 0.047UF, 10%, 100V	04222	SR301C473KAA
C134	295-0156-00			CAP SET, MATCHED: (2) 1UF, (2) 0.01UF, (1) 10.1UF MATCHED 0.75% (C134, C136, C138, C150 AND C152 FURNISHED AS A UNIT) (INDIVIDUAL TIMING CAPACITORS IN THIS ASSY MUST BE ORDERED BY THE 9-DIGIT PART NUMBER LETTER SUFFIX AND TOLERANCE PRINTED ON THE TIMING CAP TO BE REPLACED. THE TOLERANCE AND LETTER SUFFIX SHOULD BE THE SAME FOR ALL OF THE TIMING CAPS IN THE ASSY. EXAMPLE: 285-XXXX-XX F-) (SEE FOOTNOTE ON C134) (SEE FOOTNOTE ON C134)	80009	295-0156-00
C136						
C138						
C141	290-0522-00	B010100	B019999	CAP, FXD, ELCTLT: 1UF, 20%, 50V	05397	T368A105M050AZ
C141	283-0111-00	B110000	B236699	CAP, FXD, CER DI: 0.1UF, 20%, 50V	05397	C330C104M5U1CA
C141	283-0178-00	B236700		CAP, FXD, CER DI: 0.1UF, 20%, 100V	05397	C330C104Z1U1CA
C150	-----			(SEE FOOTNOTE ON C134)		
C152	-----			(SEE FOOTNOTE ON C134)		
C230	283-0000-00			CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C232	283-0178-00			CAP, FXD, CER DI: 0.1UF, 20%, 100V	05397	C330C104Z1U1CA
C234	283-0000-00			CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C236	283-0178-00			CAP, FXD, CER DI: 0.1UF, 20%, 100V	05397	C330C104Z1U1CA
C238	283-0000-00			CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C240	283-0178-00			CAP, FXD, CER DI: 0.1UF, 20%, 100V	05397	C330C104Z1U1CA
C242	283-0000-00			CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C244	283-0178-00			CAP, FXD, CER DI: 0.1UF, 20%, 100V	05397	C330C104Z1U1CA
C301	281-0178-00	B010100	B209999	CAP, VAR, PLASTIC: 1-3.5PF, 500V	80031	2805D013R5BHO2F0
C305	283-0081-00	B210000		CAP, FXD, CER DI: 0.1UF, +80-20%, 25V	59821	2DDU69E104Z
C310	283-0000-00			CAP, FXD, CER DI: 0.001UF, +100-0%, 500V	59660	831-610-Y5U0102P
C311	281-0523-00	B210000		CAP, FXD, CER DI: 100PF, 20%, 350V	52763	2RDPLZ007 100PMU
C312	283-0081-00	B210000		CAP, FXD, CER DI: 0.1UF, +80-20%, 25V	59821	2DDU69E104Z
C313	281-0542-00	B010100	B129999	CAP, FXD, CER DI: 18PF, 10%, 500V	52763	2RDPLZ007 18POKC
C313	281-0605-00	B130000	B209999	CAP, FXD, CER DI: 200PF, 10%, 500V	59660	301000Y5D201K
C317	283-0079-00	B010100	B209999	CAP, FXD, CER DI: 0.01UF, 20%, 250V	04222	SR503C103MAA
C317	283-0002-00	B210000		CAP, FXD, CER DI: 0.01UF, +80-20%, 500V	59821	D103Z40Z5LAD5EG
C319	290-0517-00	B010100	B209999	CAP, FXD, ELCTLT: 6.8UF, 20%, 35V	05397	T368B685M035AZ
C323	281-0511-00	B210000	B229999	CAP, FXD, CER DI: 22PF, +/-2.2PF, 500V	52763	2RDPLZ007 22POKC
C323	281-0123-00	B230000		CAP, VAR, CER DI: 5-25PF, 100V	59660	518-000A5-25
C324	283-0633-00	B010100	B209999	CAP, FXD, MICA DI: 77PF, 1%, 100V	00853	D155E770F0
C330	283-0212-00	B010100	B209999	CAP, FXD, CER DI: 2UF, 20%, 50V	04222	SR405E205MAA
C330	283-0203-00	B210000		CAP, FXD, CER DI: 0.47UF, 20%, 50V	04222	SR3055C474MAA
C340	281-0513-00	B010100	B147117	CAP, FXD, CER DI: 27PF, +/-5.4PF, 500V (7B53A ONLY)	52763	2RDPLZ007 27POMP
C340	281-0605-00	B147118	B209999	CAP, FXD, CER DI: 200PF, 10%, 500V (7B53A ONLY)	59660	301000Y5D201K
C340	281-0513-00	B010100	B144429	CAP, FXD, CER DI: 27PF, +/-5.4PF, 500V	52763	2RDPLZ007 27POMP

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
C340	281-0605-00	B144430	B209999	(7B53AN ONLY) CAP,FXD,CER DI:200PF,10%,500V	59660	301000Y5D201K
C344	281-0513-00	B010100	B147117	(7B53AN ONLY) CAP,FXD,CER DI:27PF,+/-5.4PF,500V	52763	2RDPLZ007 27POMP
C344	281-0605-00	B147118	B209999	(7B53A ONLY) CAP,FXD,CER DI:200PF,10%,500V	59660	301000Y5D201K
C344	281-0513-00	B010100	B144429	(7B53A ONLY) CAP,FXD,CER DI:27PF,+/-5.4PF,500V	52763	2RDPLZ007 27POMP
C344	281-0605-00	B144430	B209999	(7B53A ONLY) CAP,FXD,CER DI:200PF,10%,500V	59660	301000Y5D201K
C347	283-0000-00	B010100	B209999	(7B53AN ONLY) CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C350	283-0203-00	B210000		CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
C359	283-0114-00	B010100	B019999	CAP,FXD,CER DI:1500PF,5%,200V (7B53AN ONLY)	59660	805-534-Y5D0152J
C363	283-0047-00	B010100	B209999	CAP,FXD,CER DI:270PF,5%,500V	59660	0831604Z5F0271J
C370	290-0782-00	B210000		CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
C372	290-0782-00	B210000		CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
C374	290-0782-00	B210000		CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
C377	281-0504-00	B010100	B209999	CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C396	290-0522-00	B010100	B209999	CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C401	281-0091-00	B010100	B209999	CAP,VAR,CER DI:2-8PF,350V	33095	53-717-001 A2-8
C405	283-0081-00	B210000		CAP,FXD,CER DI:0.1UF,+80-20%,25V	59821	2DDU69E104Z
C410	283-0000-00	B210000		CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C411	283-0000-00	B010100	B209999	CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C411	281-0523-00	B210000		CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C412	283-0081-00	B210000		CAP,FXD,CER DI:0.1UF,+80-20%,25V	59821	2DDU69E104Z
C414	281-0542-00	B010100	B209999	CAP,FXD,CER DI:18PF,10%,500V	52763	2RDPLZ007 18P0KCC
C417	283-0079-00	B010100	B209999	CAP,FXD,CER DI:0.01UF,20%,250V	04222	SR503C103MAA
C417	283-0002-00	B210000		CAP,FXD,CER DI:0.01UF,+80-20%,500V	59821	D103Z40Z5ULADEG
C419	290-0517-00	B010100	B209999	CAP,FXD,ELCTLT:6.8UF,20%,35V	05397	T368B685M035AZ
C423	281-0628-00	B210000	B229999	CAP,FXD,CER DI:15PF,5%,500V	52763	2RDPLZ007 15P0JCC
C423	281-0123-00	B230000		CAP,VAR,CER DI:5-25PF,100V	59660	518-000A5-25
C424	283-0633-00	B010100	B209999	CAP,FXD,MICA DI:77PF,1%,100V	00853	D155E770F0
C430	283-0203-00	B210000		CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
C431	283-0212-00	B010100	B209999	CAP,FXD,CER DI:2UF,20%,50V	04222	SR405E205MAA
C440	281-0513-00	B010100	B209999	CAP,FXD,CER DI:27PF,+/-5.4PF,500V	52763	2RDPLZ007 27POMP
C444	281-0513-00	B010100	B209999	CAP,FXD,CER DI:27PF,+/-5.4PF,500V	52763	2RDPLZ007 27POMP
C447	283-0000-00	B010100	B209999	CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C450	283-0203-00	B210000		CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305SC474MAA
C459	283-0114-00	B010100	B019999	CAP,FXD,CER DI:1500PF,5%,200V (7B53AN ONLY)	59660	805-534-Y5D0152J
C463	283-0047-00	B010100	B209999	CAP,FXD,CER DI:270PF,5%,500V	59660	0831604Z5F0271J
C468	283-0000-00	B010100	B209999	CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C468	283-0002-00	B210000		CAP,FXD,CER DI:0.01UF,+80-20%,500V	59821	D103Z40Z5ULADEG
C477	281-0523-00	B010100	B209999	CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C496	290-0522-00	B010100	B209999	CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C506	290-0527-00			CAP,FXD,ELCTLT:15UF,20%,20V	05397	T368B156M020AS
C519	281-0523-00			CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C520	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C527	281-0650-00	B030000		CAP,FXD,CER DI:18PF,10%,200V	59660	374-018COGO-180K
C528	283-0047-00	B210000		CAP,FXD,CER DI:270PF,5%,500V	59660	0831604Z5F0271J
C533	283-0087-00			CAP,FXD,CER DI:300PF,10%,1000V	59660	0838020X5F00301K
C535	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C551	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C555	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C568	281-0523-00			CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C572	290-0524-00			CAP,FXD,ELCTLT:4.7UF,20%,10V	05397	T368A475M010AZ
C578	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
C579	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C580	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C582	281-0593-00			CAP,FXD,CER DI:3.9PF,+/-0.25PF,500V	52763	2RDPLZ007 3P90CC
C589	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C590	281-0523-00			CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C591	281-0629-00	B010100	8019999	CAP,FXD,CER DI:33PF,5%,600V	52763	2RDPLZ007 33P0JC
C591	281-0519-00	B020000	8237099	CAP,FXD,CER DI:47PF,+/-4.7PF,500V	52763	2RDPLZ007 47POKC
C591	281-0574-00	B237100		CAP,FXD,CER DI:82PF,10%,500V	52763	2RDPLZ007 82POKS
C594	281-0166-00			CAP,VAR,AIR DI:1.9-15.7 PF,250V	74970	187-0109-055
C595	283-0631-00			CAP,FXD,MICA DI:95PF,1%,500V	00853	D155F950F0
C610	290-0522-00			CAP,FXD,ELCTLT:2.2UF,20%,20V	05397	T368A225M020AS
C611	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C615	283-0051-00	B010100	8059999	CAP,FXD,CER DI:0.0033UF,5%,100V	04222	SR301A332JAA
C615	283-0000-00	B060000		CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C616	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C618	283-0059-00	B080000		CAP,FXD,CER DI:1UF,+80-20%,25V	31433	C330C105M5R5CA
C637	281-0518-00			CAP,FXD,CER DI:47PF,+/-9.4PF,500V	52763	2RDPLZ007 47POMU
C638	281-0518-00			CAP,FXD,CER DI:47PF,+/-9.4PF,500V	52763	2RDPLZ007 47POMU
C639	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C643	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C644	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C647	290-0523-00			CAP,FXD,ELCTLT:2.2UF,20%,20V	05397	T368A225M020AS
C650	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C652	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C660	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C663	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C677	281-0523-00			CAP,FXD,CER DI:100PF,20%,350V	52763	2RDPLZ007 100PMU
C678	281-0518-00			CAP,FXD,CER DI:47PF,+/-9.4PF,500V	52763	2RDPLZ007 47POMU
C679	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C680	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C683	281-0544-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,500V	52763	2RDPLZ007 270POM
C689	281-0504-00			CAP,FXD,CER DI:10PF,+/-1PF,500V	54583	TCC20CH2H100FYA
C690	283-0631-00			CAP,FXD,MICA DI:95PF,1%,500V	00853	D155F950F0
C691	281-0166-00			CAP,VAR,AIR DI:1.9-15.7 PF,250V	74970	187-0109-055
C706	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C708	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C710	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C713	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C716	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C718	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C728	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C731	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	59660	831-610-Y5U0102P
C768	281-0612-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,500V	52763	2RDPLZ007 5P60DC
C800	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C801	290-0529-00	B010100	8049999	CAP,FXD,ELCTLT:47UF,20%,20V	05397	T362C476M020AS
C801	290-0134-00	B050000	8119999	CAP,FXD,ELCTLT:22UF,20%,15V	05397	T110B226M015AS
C801	290-0162-00	B120000		CAP,FXD,ELCTLT:22UF,20%,35V	05397	T110C226M035AS
C803	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
C804	290-0535-00			CAP,FXD,ELCTLT:33UF,20%,10V TANTALUM	56289	196D336X0010KA1
C806	290-0522-00			CAP,FXD,ELCTLT:1UF,20%,50V	05397	T368A105M050AZ
C807	290-0529-00	B010100	8049999	CAP,FXD,ELCTLT:47UF,20%,20V	05397	T362C476M020AS
C807	290-0134-00	B050000	8119999	CAP,FXD,ELCTLT:22UF,20%,15V	05397	T110B226M015AS
C807	290-0162-00	B120000		CAP,FXD,ELCTLT:22UF,20%,35V	05397	T110C226M035AS
C809	283-0003-00			CAP,FXD,CER DI:0.01UF,+80-20%,150V	59821	D103Z40Z5UJDCX
CR31	152-0141-02			SEMICONV DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR109	152-0141-02			SEMICONV DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR182	152-0075-00	B010100	8241889	SEMICONV DVC,DI:SW,GE,22V,80MM,DO-7 (7B53A ONLY)	14433	G866

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discnt	Name & Description	Mfr. Code	Mfr. Part No.
CR182	152-0141-02	B241890		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR184	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR185	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR186	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR187	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR188	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR201	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR210	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR220	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR255	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR257	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR263	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR265	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR267	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR275	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR280	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR281	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR283	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR285	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR288	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR306	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR307	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR308	152-0141-02	B035836	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR308	152-0141-02	B134215		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53AN ONLY)	03508	DA2527 (1N4152)
CR340	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR343	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR361	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR365	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR401	152-0141-02	B135836	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR401	152-0141-02	B134215	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7583AN ONLY)	03508	DA2527 (1N4152)
CR406	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR407	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR409	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR440	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR443	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR461	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR465	152-0141-02	B010100	B209999	SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR468	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR469	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR504	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR505	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR513	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR516	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR519	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR528	152-0141-02	B210000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR556	152-0141-02	B100000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR566	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR582	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MW,DO-7	14433	G866
CR582	152-0322-00	B241890		SEMICON DVC,DI:SCHOTTKY,SI,15V,1.2PF,DO-35	50434	5082-2672

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
CR617	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR624	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR629	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR635	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR641	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR648	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR654	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR655	152-0141-02	B080000		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR661	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR662	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR677	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR678	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR678	152-0141-02	B241890		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR686	152-0307-00			SEMICON DVC,DI:SW,SI,100V,0.13A,DO-92	04713	SSD1150
CR695	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR697	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR717	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR728	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR731	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR735	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR736	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR743	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR752	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR776	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR777	152-0141-02			SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR901	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR901	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR903	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR903	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR905	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR905	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR907	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR907	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR909	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR909	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR911	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR911	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR913	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR913	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR915	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR915	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
CR917	152-0075-00	B010100	B241889	(7B53A ONLY) SEMICON DVC,DI:SW,GE,22V,80MM,DO-7	14433	G866
CR917	152-0141-02	B241890		(7B53A ONLY) SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
CR919	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7 (7B53A ONLY)	14433	G866
CR919	152-0141-02	B241890		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR921	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7 (7B53A ONLY)	14433	G866
CR921	152-0141-02	B241890		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
CR923	152-0075-00	B010100	B241889	SEMICON DVC,DI:SW,GE,22V,80MM,DO-7 (7B53A ONLY)	14433	G866
CR923	152-0141-02	B241890		SEMICON DVC,DI:SW,SI,30V,150MA,30V,DO-35 (7B53A ONLY)	03508	DA2527 (1N4152)
DS8	150-0048-01	B010100	B199999	LAMP,INCAND:5V,0.06A,#683,AGED & SEL	58854	683AS15
DS8	150-1029-00	B200000	B242463	LT EMITTING DIO:GREEN,565NM,35MA	58361	Q6480/MV5274C
DS8	150-1078-00	B242464		LT EMITTING DIO:GREEN,565NM,20MA	50434	HLMP 1503
DS30	150-0048-01			LAMP,INCAND:5V,0.06A,#683,AGED & SEL	58854	683AS15
E376	276-0543-00	B190000	B209999	SHLD BEAD,ELEK:FERRITE (NOMINAL INSTALLED, TEST SELECTED)	80009	276-0543-00
J1	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
J3	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
L231	120-0382-00			COIL,RF:210UH,+28%-43%,14 TURNS	80009	120-0382-00
L235	120-0382-00			COIL,RF:210UH,+28%-43%,14 TURNS	80009	120-0382-00
L239	120-0382-00			COIL,RF:210UH,+28%-43%,14 TURNS	80009	120-0382-00
L243	120-0382-00			COIL,RF:210UH,+28%-43%,14 TURNS	80009	120-0382-00
L330	276-0507-00	B010100	B209999	SHLD BEAD,ELEK:FERRITE	02114	56-590-65B/3B
L431	276-0507-00	B010100	B209999	SHLD BEAD,ELEK:FERRITE	02114	56-590-65B/3B
LR580	108-0333-00			COIL,RF:FIXED,881NH	TK1345	108-0333-00
LR650	108-0333-00			COIL,RF:FIXED,881NH	TK1345	108-0333-00
Q52	151-0223-00			TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q61	151-0223-00			TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q66	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q70	151-0220-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0220-00
Q212	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
Q261	151-0341-00	B010100	B049999	TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
Q261	151-0302-00	B050000		TRANSISTOR:NPN,SI,TO-18	04713	ST899
Q262	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
Q271	151-0341-00			TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
Q279	151-0341-00	B010100	B049999	TRANSISTOR:NPN,SI,TO-106	04713	SPS6919
Q279	151-0302-00	B050000		TRANSISTOR:NPN,SI,TO-18	04713	ST899
Q280	151-0220-00			TRANSISTOR:PMP,SI,TO-92	80009	151-0220-00
Q310	151-1042-00			SEMICON DVC SE:FET,SI,TO-92 (PART OF Q310)	04713	SPF627M2
Q311	-----					
Q315	151-0221-00	B010100	B209999	TRANSISTOR:PMP,SI,TO-92	80009	151-0221-00
Q315	151-0220-00	B210000		TRANSISTOR:PMP,SI,TO-92	80009	151-0220-00
Q320	151-0367-00	B010100	B209999	TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
Q320	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q322	151-0367-00	B010100	B209999	TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
Q322	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q352	151-0199-04	B210000		TRANSISTOR:PMP,SI,TO-92	80009	151-0199-04
Q355	151-0199-04	B210000		TRANSISTOR:PMP,SI,TO-92	80009	151-0199-04
Q362	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q366	151-0223-00	B010100	B209999	TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026
Q382	151-0188-00	B010100	B209999	TRANSISTOR:PMP,SI,TO-92	80009	151-0188-00
Q410	151-1042-00			SEMICON DVC SE:FET,SI,TO-92 (PART OF Q410)	04713	SPF627M2
Q411	-----					
Q415	151-0221-00	B010100	B209999	TRANSISTOR:PMP,SI,TO-92	80009	151-0221-00
Q415	151-0220-00	B210000		TRANSISTOR:PMP,SI,TO-92	80009	151-0220-00
Q420	151-0367-00	B010100	B209999	TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
Q420	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MM,TO-92	04713	SPS8026

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discnt	Name & Description	Mfr. Code	Mfr. Part No.
Q422	151-0367-00	B010100	B209999	TRANSISTOR:NPN,SI,X-55	04713	SPS 8811
Q422	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q452	151-0199-04	B210000		TRANSISTOR:PNP,SI,TO-92	80009	151-0199-04
Q455	151-0199-04	B210000		TRANSISTOR:PNP,SI,TO-92	80009	151-0199-04
Q456	151-0190-00	B210000		TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q462	151-0223-00	B210000		TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q466	151-0223-00	B010100	B209999	TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q482	151-0188-00	B010100	B209999	TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
Q513	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
Q516	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q524	151-0301-00			TRANSISTOR:PNP,SI,TO-18	04713	ST898
Q528	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
Q538	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q544	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q547	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q551	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q560	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q562	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
Q564	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
Q568	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
Q584	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
Q596	151-1004-00	B010100	B186299	TRANSISTOR:FET,N-CHAN,SI,TO-106	04713	SPF3034
Q596	151-1078-00	B186300		TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3040
Q603	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q608	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q610	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q620	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
Q628	151-0192-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS8801
Q633	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q639	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q642	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q647	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
Q654	151-0221-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0221-00
Q656	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
Q659	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q665	151-0223-00			TRANSISTOR:NPN,SI,625MW,TO-92	04713	SPS8026
Q671	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
Q678	151-0289-00			TRANSISTOR:PNP,SI,TO-18	80009	151-0289-00
Q682	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q684	151-0259-00			TRANSISTOR:NPN,SI,TO-106	07263	S39288
Q688	151-0259-00			TRANSISTOR:NPN,SI,TO-106	07263	S39288
Q695	151-0216-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803
Q696	151-0216-00			TRANSISTOR:PNP,SI,TO-92	04713	SPS8803
Q698	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
Q720	151-0192-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS8801
Q724	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
Q734	151-0219-00			TRANSISTOR:PNP,SI,R-124	07263	S022650
Q754	151-0224-00			TRANSISTOR:NPN,SI,TO-92	04713	SPS6917
Q764	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
R1	323-0452-00			RES,FXD,FILM:499K OHM,1%,0.5W,TC=TO	75042	CECT0-4993F
R2	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R4	311-1192-00	B010100	B242519	RES,VAR,NONWW:PNL,10K OHM,1W,W/SW	12697	381-CM39695
R4	311-2303-00	B242520		RES,VAR,NONWW:PNL,10K OHM,10%,LINEAR,0.25W	12697	CM45205
R5	311-1322-00	B010100	B242519	RES,VAR,NONWW:PNL,5K OHM,1W,W/SW	12697	381-CM39701
R5	311-2304-00	B242520		RES,VAR,NONWW:PNL,5K OHM,10%,LINEAR,0.5W	12697	CM45204
R7	315-0151-00	B200000	B242463	RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
R7	315-0201-00	B242464		RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R8	311-1162-00	B010100	B242519	RES,VAR,NONWW:PNL,2 X 10K OHM,1W	12697	0381-CM 39691

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
R8	311-2315-00	B242520		RES,VAR, NONWV: (2)10K, 10%, 0.5W	12697	CM45209
R9	311-0946-00			RES,VAR, WV: TRMR, 50K OHM, 2W	02111	534-0070
R15	315-0470-00			RES,FXD, FILM: 47 OHM, 5%, 0.25W	57668	NTR25J-E47E0
R17	321-0448-00			RES,FXD, FILM: 453K OHM, 1%, 0.125W, TC=TO	07716	CEAD45302F
R18	321-0361-00			RES,FXD, FILM: 56.2K OHM, 1%, 0.125W, TC=TO	07716	CEAD56201F
R19	315-0470-00			RES,FXD, FILM: 47 OHM, 5%, 0.25W	57668	NTR25J-E47E0
R23	315-0224-00			RES,FXD, FILM: 220K OHM, 5%, 0.25W	57668	NTR25J-E220K
R25	315-0333-00			RES,FXD, FILM: 33K OHM, 5%, 0.25W	57668	NTR25J-E33K0
R29	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R41	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R42	323-0452-00			RES,FXD, FILM: 499K OHM, 1%, 0.5W, TC=TO	75042	CECT0-4993F
R43	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R50	321-0071-00			RES,FXD, FILM: 53.6 OHM, 1%, 0.125W, TC=TO	91637	CMF55116653R60F
R52	321-0126-00			RES,FXD, FILM: 200 OHM, 1%, 0.125W, TC=TO (7B53A ONLY)	19701	5033ED200ROF
R52	315-0431-00	B010100	B019999	RES,FXD, FILM: 430 OHM, 5%, 0.25W (7B53AN ONLY)	19701	5043CX430R0J
R52	321-0126-00	B020000		RES,FXD, FILM: 200 OHM, 1%, 0.125W, TC=TO (7B53AN ONLY)	19701	5033ED200ROF
R54	321-0020-00	B010100	B209999	RES,FXD, FILM: 15.8 OHM, 1%, 0.125W, TC=TO	57668	RB14FXE 15E8
R54	321-0039-00	B210000		RES,FXD, FILM: 24.9 OHM, 1%, 0.125W, TC=TO	91637	CMF55116624R90F
R56	323-0151-00			RES,FXD, FILM: 365 OHM, 1%, 0.5W, TC=TO	19701	5053RD365R0F
R58	321-0020-00	B010100	B209999	RES,FXD, FILM: 15.8 OHM, 1%, 0.125W, TC=TO	57668	RB14FXE 15E8
R58	321-0039-00	B210000		RES,FXD, FILM: 24.9 OHM, 1%, 0.125W, TC=TO	91637	CMF55116624R90F
R59	321-0071-00			RES,FXD, FILM: 53.6 OHM, 1%, 0.125W, TC=TO	91637	CMF55116653R60F
R60	315-0121-00			RES,FXD, FILM: 120 OHM, 5%, 0.25W (7B53A ONLY)	19701	5043CX120R0J
R60	315-0121-00	B020000		RES,FXD, FILM: 120 OHM, 5%, 0.25W (7B53AN ONLY)	19701	5043CX120R0J
R61	321-0126-00			RES,FXD, FILM: 200 OHM, 1%, 0.125W, TC=TO (7B53A ONLY)	19701	5033ED200ROF
R61	321-0158-00	B010100	B019999	RES,FXD, FILM: 432 OHM, 1%, 0.125W, TC=TO (7B53AN ONLY)	07716	CEAD432ROF
R61	321-0126-00	B020000		RES,FXD, FILM: 200 OHM, 1%, 0.125W, TC=TO (7B53AN ONLY)	19701	5033ED200ROF
R62	315-0101-00	B010100	B209999	RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R62	315-0223-00	B210000		RES,FXD, FILM: 22K OHM, 5%, 0.25W	19701	5043CX22K00J92U
R63	321-0237-00			RES,FXD, FILM: 2.87K OHM, 1%, 0.125W, TC=TO	07716	CEAD 28700F
R64	315-0821-00	B010100	B209999	RES,FXD, FILM: 820 OHM, 5%, 0.25W	19701	5043CX820R0J
R64	315-0101-00	B210000		RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R66	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R67	315-0510-00			RES,FXD, FILM: 51 OHM, 5%, 0.25W	19701	5043CX51R00J
R68	315-0201-00			RES,FXD, FILM: 200 OHM, 5%, 0.25W	57668	NTR25J-E200E
R70	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R72	311-1227-00			RES,VAR, NONWV: TRMR, 5K OHM, 0.5W	32997	3386F-T04-502
R73	321-0324-00			RES,FXD, FILM: 23.2K OHM, 1%, 0.125W, TC=TO	07716	CEAD23201F
R74	321-0210-00			RES,FXD, FILM: 1.50K OHM, 1%, 0.125W, TC=TO	19701	5033ED1K50F
R76	315-0510-00			RES,FXD, FILM: 51 OHM, 5%, 0.25W	19701	5043CX51R00J
R80	315-0472-00			RES,FXD, FILM: 4.7K OHM, 5%, 0.25W	57668	NTR25J-E04K7
R82	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R105	315-0103-00			RES,FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R107	315-0623-00			RES,FXD, FILM: 62K OHM, 5%, 0.25W	19701	5043CX62K00J
R109	315-0624-00			RES,FXD, FILM: 620K OHM, 5%, 0.25W	19701	5043CX620K0J
R110	325-0082-00	B010100	B160099	RES,FXD, FILM: 33.51 MEG OHM, 0.1%, 1W, TC=T2	03888	PME75C33514B
R110	325-0082-03	B160100		RES,FXD, FILM: 33.51M OHM, 0.25%, 1W, TC=T2	19647	MG731 33.51M.25%
R112	325-0081-00			RES,FXD, FILM: 11.17 MEG OHM, 0.1%, 0.5W, TC=T9	03888	PME7011.17MOHM.1
R114	325-0081-00			RES,FXD, FILM: 11.17 MEG OHM, 0.1%, 0.5W, TC=T9	03888	PME7011.17MOHM.1
R117	325-0080-00			RES,FXD, FILM: 3.351 MEG OHM, 0.1%, 0.5W, TC=T9	91637	MFF1-C33513B

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
R119	323-0789-07			RES,FXD,FILM:1.117MEG OHM,0.1%,0.5W,TC=T9	07716	CECE11173B
R121	323-0789-07			RES,FXD,FILM:1.117MEG OHM,0.1%,0.5W,TC=T9	07716	CECE11173B
R124	323-0788-07			RES,FXD,FILM:558.5K OHM,0.1%,0.5W,TC=T9	19701	5053RE558K5B
R126	323-0787-07			RES,FXD,FILM:223.4K OHM,0.1%,0.5W,TC=T9	19701	5053RE223K4B
R128	323-0786-07			RES,FXD,FILM:111.7K OHM,0.1%,0.5W,TC=T9	19701	5053RE111K7B
R130	323-0785-07			RES,FXD,FILM:55.85K OHM,0.1%,0.5W,TC=T9	19701	MF7CE55851B
R139	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
R141	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R144	311-1321-00			RES,VAR,NONWV:P/NL,20K OHM,0.5W,W/SW	01121	18M652
R146	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R149	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
R154	323-0785-07			RES,FXD,FILM:55.85K OHM,0.1%,0.5W,TC=T9	19701	MF7CE55851B
R156	323-0786-07			RES,FXD,FILM:111.7K OHM,0.1%,0.5W,TC=T9	19701	5053RE111K7B
R158	323-0787-07			RES,FXD,FILM:223.4K OHM,0.1%,0.5W,TC=T9	19701	5053RE223K4B
R160	323-0788-07			RES,FXD,FILM:558.5K OHM,0.1%,0.5W,TC=T9	19701	5053RE558K5B
R164	325-0080-00			RES,FXD,FILM:3.351 MEG OHM,0.1%,0.5W,TC=T9	91637	MFF1-C33513B
R166	323-0789-07			RES,FXD,FILM:1.117MEG OHM,0.1%,0.5W,TC=T9	07716	CECE11173B
R168	323-0789-07			RES,FXD,FILM:1.117MEG OHM,0.1%,0.5W,TC=T9	07716	CECE11173B
R170	325-0082-00	B010100	B160099	RES,FXD,FILM:33.51 MEG OHM,0.1%,1W,TC=T2	03888	PME75C33514B
R170	325-0082-03	B160100		RES,FXD,FILM:33.51M OHM,0.25%,1W,TC=T2	19647	MG731 33.51M.25%
R172	325-0081-00			RES,FXD,FILM:11.17 MEG OHM,0.1%,0.5W,TC=T9	03888	PME7011.17MOHM.1
R174	325-0081-00			RES,FXD,FILM:11.17 MEG OHM,0.1%,0.5W,TC=T9	03888	PME7011.17MOHM.1
R181	315-0151-00	B150000		RES,FXD,FILM:150 OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150E
R182	315-0133-00			RES,FXD,FILM:13K OHM,5%,0.25W (7B53A ONLY)	19701	5043CX13K00J
R184	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E03K3
R185	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E03K3
R186	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E03K3
R188	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E03K3
R205	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
R210	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R211	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R231	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R235	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R239	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R243	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R258	315-0103-00	B010100	B049999	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R258	315-0272-00	B050000		RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
R259	315-0203-00	B010100	B049999	RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R259	315-0202-00	B050000		RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R261	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R262	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R263	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R264	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R268	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R269	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R271	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
R276	315-0103-00	B010100	B049999	RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R276	315-0272-00	B050000		RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
R277	315-0203-00	B010100	B049999	RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R277	315-0202-00	B050000		RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R279	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
R280	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R281	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discnt	Name & Description	Mfr. Code	Mfr. Part No.
R290	311-1060-00			RES,VAR, NONW: TRMR, 500 OHM, 0.75W	02111	70Y-501T613
R301	315-0510-00			RES,FXD, FILM: 51 OHM, 5%, 0.25W	19701	5043CX51R00J
R303	321-0452-00			RES,FXD, FILM: 499K OHM, 1%, 0.125W, TC=TO	19701	5043ED499K0F
R305	315-0102-00	B210000		RES,FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R306	315-0202-00	B210000		RES,FXD, FILM: 2K OHM, 5%, 0.25W	57668	NTR25J-E 2K
R307	315-0512-00	B010100	B135835	RES,FXD, FILM: 5.1K OHM, 5%, 0.25W (7B53A ONLY)	57668	NTR25J-E05K1
R307	315-0512-00	B010100	B134214	RES,FXD, FILM: 5.1K OHM, 5%, 0.25W (7B53AN ONLY)	57668	NTR25J-E05K1
R310	315-0511-00			RES,FXD, FILM: 510 OHM, 5%, 0.25W	19701	5043CX510R0J
R311	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R312	315-0431-00			RES,FXD, FILM: 430 OHM, 5%, 0.25W	19701	5043CX430R0J
R313	315-0101-00			RES,FXD, FILM: 100 OHM, 5%, 0.25W	57668	NTR25J-E 100E
R315	315-0102-00	B010100	B209999	RES,FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R315	315-0202-00	B210000		RES,FXD, FILM: 2K OHM, 5%, 0.25W	57668	NTR25J-E 2K
R317	315-0751-00	B010100	B209999	RES,FXD, FILM: 750 OHM, 5%, 0.25W	57668	NTR25J-E750E
R317	315-0821-00	B210000		RES,FXD, FILM: 820 OHM, 5%, 0.25W	19701	5043CX820R0J
R320	315-0221-00	B010100	B129999	RES,FXD, FILM: 220 OHM, 5%, 0.25W	57668	NTR25J-E220E
R320	315-0331-00	B130000	B209999	RES,FXD, FILM: 330 OHM, 5%, 0.25W	57668	NTR25J-E330E
R320	315-0121-00	B210000		RES,FXD, FILM: 120 OHM, 5%, 0.25W	19701	5043CX120R0J
R321	315-0820-00	B210000		RES,FXD, FILM: 82 OHM, 5%, 0.25W	57668	NTR25J-E82E0
R322	315-0221-00	B010100	B129999	RES,FXD, FILM: 220 OHM, 5%, 0.25W	57668	NTR25J-E220E
R322	315-0331-00	B130000	B209999	RES,FXD, FILM: 330 OHM, 5%, 0.25W	57668	NTR25J-E330E
R322	315-0121-00	B210000		RES,FXD, FILM: 120 OHM, 5%, 0.25W	19701	5043CX120R0J
R325	315-0150-00	B010100	B069999	RES,FXD, FILM: 15 OHM, 5%, 0.25W	19701	5043CX15R00J
R325	315-0100-00	B070000	B209999	RES,FXD, FILM: 10 OHM, 5%, 0.25W	19701	5043CX10RR00J
R325	315-0750-00	B210000		RES,FXD, FILM: 75 OHM, 5%, 0.25W	57668	NTR25J-E75E0
R326	315-0122-00	B010100	B129999	RES,FXD, FILM: 1.2K OHM, 5%, 0.25W	57668	NTR25J-E01K2
R326	315-0162-00	B130000	B209999	RES,FXD, FILM: 1.6K OHM, 5%, 0.25W	19701	5043CX1K600J
R326	315-0182-00	B210000		RES,FXD, FILM: 1.8K OHM, 5%, 0.25W	57668	NTR25J-E1K8
R328	315-0150-00	B010100	B069999	RES,FXD, FILM: 15 OHM, 5%, 0.25W	19701	5043CX15R00J
R328	315-0100-00	B070000	B209999	RES,FXD, FILM: 10 OHM, 5%, 0.25W	19701	5043CX10RR00J
R328	315-0750-00	B210000		RES,FXD, FILM: 75 OHM, 5%, 0.25W	57668	NTR25J-E75E0
R329	315-0330-00	B210000		RES,FXD, FILM: 33 OHM, 5%, 0.25W	19701	5043CX33R00J
R330	315-0102-00	B010100	B209999	RES,FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R330	315-0511-00	B210000		RES,FXD, FILM: 510 OHM, 5%, 0.25W	19701	5043CX510R0J
R332	315-0472-00			RES,FXD, FILM: 4.7K OHM, 5%, 0.25W	57668	NTR25J-E04K7
R333	311-1228-00			RES,VAR, NONW: TRMR, 10K OHM, 0.5W	32997	3386F-T04-103
R335	315-0152-00	B010100	B209999	RES,FXD, FILM: 1.5K OHM, 5%, 0.25W	57668	NTR25J-E01K5
R335	315-0472-00	B210000		RES,FXD, FILM: 4.7K OHM, 5%, 0.25W (NOMINAL VALUE, SELECTED)	57668	NTR25J-E04K7
R339	315-0431-00	B010100	B209999	RES,FXD, FILM: 430 OHM, 5%, 0.25W (7B53A ONLY)	19701	5043CX430R0J
R339	315-0431-00	B020000	B209999	RES,FXD, FILM: 430 OHM, 5%, 0.25W (7B53AN ONLY)	19701	5043CX430R0J
R340	315-0201-00	B010100	B147117	RES,FXD, FILM: 200 OHM, 5%, 0.25W (7B53A ONLY)	57668	NTR25J-E200E
R340	315-0120-00	B147118	B209999	RES,FXD, FILM: 12 OHM, 5%, 0.25W (7B53A ONLY)	57668	NTR25J-R12
R340	315-0220-00	B210000		RES,FXD, FILM: 22 OHM, 5%, 0.25W (7B53A ONLY)	19701	5043CX22R00J
R340	315-0201-00	B010100	B144429	RES,FXD, FILM: 200 OHM, 5%, 0.25W (7B53AN ONLY)	57668	NTR25J-E200E
R340	315-0120-00	B144430	B209999	RES,FXD, FILM: 12 OHM, 5%, 0.25W (7B53AN ONLY)	57668	NTR25J-R12
R340	315-0220-00	B210000		RES,FXD, FILM: 22 OHM, 5%, 0.25W (7B53AN ONLY)	19701	5043CX22R00J
R341	315-0242-00	B010100	B209999	RES,FXD, FILM: 2.4K OHM, 5%, 0.25W	57668	NTR25J-E02K4
R342	315-0431-00	B010100	B209999	RES,FXD, FILM: 430 OHM, 5%, 0.25W (7B53A ONLY)	19701	5043CX430R0J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discount	Name & Description	Mfr. Code	Mfr. Part No.
R342	315-0431-00	B020000	B209999	RES,FXD,FILM:430 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX430R0J
R343	315-0242-00	B010100	B209999	RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R344	315-0201-00	B010100	B147117	RES,FXD,FILM:200 OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E200E
R344	315-0120-00	B147118	B209999	RES,FXD,FILM:12 OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-R12
R344	315-0220-00	B210000		RES,FXD,FILM:22 OHM,5%,0.25W (7B53A ONLY)	19701	5043CX22R00J
R344	315-0201-00	B010100	B144429	RES,FXD,FILM:200 OHM,5%,0.25W (7B53AN ONLY)	57668	NTR25J-E200E
R344	315-0120-00	B144430	B209999	RES,FXD,FILM:12 OHM,5%,0.25W (7B53AN ONLY)	57668	NTR25J-R12
R344	315-0220-00	B210000		RES,FXD,FILM:22 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX22R00J
R345	315-0102-00	B010100	B209999	RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R346	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R347	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R352	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W	01121	BB2715
R352	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R352	315-0222-00	B210000		RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
R353	315-0101-00	B210000		RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R354	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W	01121	BB2715
R354	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R354	315-0151-00	B210000		RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
R355	315-0222-00	B210000		RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
R357	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W	01121	BB2715
R357	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R358	315-0201-00	B210000		RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R359	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W (7B53A ONLY)	01121	BB2715
R359	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W (7B53A ONLY)	19701	5043CX510R0J
R359	317-0102-00	B010100	B019999	RES,FXD,CMPNSN:1K OHM,5%,0.125W (7B53AN ONLY)	01121	BB1025
R359	317-0271-00	B020000	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W (7B53AN ONLY)	01121	BB2715
R359	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX510R0J
R360	315-0510-00	B210000		RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
R361	315-0471-00	B010100	B209999	RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R362	315-0472-00	B210000		RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
R363	315-0471-00	B010100	B209999	RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R363	315-0821-00	B210000		RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
R364	315-0203-00	B010100	B209999	RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R364	315-0432-00	B210000		RES,FXD,FILM:4.3K OHM,5%,0.25W	57668	NTR25J-E04K3
R365	315-0242-00	B210000		RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R366	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R366	315-0162-00	B210000		RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
R367	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R374	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W	01121	BB2715
R374	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R375	317-0102-00	B010100	B169999	RES,FXD,CMPNSN:1K OHM,5%,0.125W (7B53A ONLY)	01121	BB1025
R375	315-0102-00	B170000	B209999	RES,FXD,FILM:1K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25JE01K0
R375	317-0102-00	B020000	B169999	RES,FXD,CMPNSN:1K OHM,5%,0.125W (7B53AN ONLY)	01121	BB1025
R375	315-0102-00	B170000	B209999	RES,FXD,FILM:1K OHM,5%,0.25W (7B53AN ONLY)	57668	NTR25JE01K0
R376	317-0271-00	B010100	B169999	RES,FXD,CMPNSN:270 OHM,5%,0.125W	01121	BB2715

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
R376	315-0271-00	B170000	B209999	RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R377	315-0271-00	B010100	B209999	RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R379	315-0751-00	B010100	B209999	RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
R383	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R384	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R386	315-0361-00	B010100	B209999	RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
R387	315-0620-00	B010100	B209999	RES,FXD,FILM:62 OHM,5%,0.25W	19701	5043CX63R00J
R401	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
R403	321-0452-00			RES,FXD,FILM:499K OHM,1%,0.125W,TC=TO	19701	5043ED499K0F
R405	315-0102-00	B210000		RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R406	315-0202-00	B210000		RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R409	315-0512-00	B010100	B135835	RES,FXD,FILM:5.1K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E05K1
R409	315-0512-00	B010100	B134214	RES,FXD,FILM:5.1K OHM,5%,0.25W (7B53AN ONLY)	57668	NTR25J-E05K1
R410	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R411	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R412	315-0101-00	B010100	B209999	RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R412	315-0431-00	B210000		RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
R413	315-0431-00	B010100	B209999	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
R413	315-0101-00	B210000		RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R415	315-0102-00	B010100	B209999	RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R415	315-0202-00	B210000		RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R417	315-0751-00	B010100	B209999	RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
R417	315-0821-00	B210000		RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
R420	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R420	315-0121-00	B210000		RES,FXD,FILM:120 OHM,5%,0.25W	19701	5043CX120R0J
R421	315-0820-00	B210000		RES,FXD,FILM:82 OHM,5%,0.25W	57668	NTR25J-E82E0
R422	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R422	315-0121-00	B210000		RES,FXD,FILM:120 OHM,5%,0.25W	19701	5043CX120R0J
R425	315-0750-00	B210000		RES,FXD,FILM:75 OHM,5%,0.25W	57668	NTR25J-E75E0
R426	315-0150-00	B010100	B209999	RES,FXD,FILM:15 OHM,5%,0.25W	19701	5043CX15R00J
R426	315-0182-00	B210000		RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
R428	315-0150-00	B010100	B209999	RES,FXD,FILM:15 OHM,5%,0.25W	19701	5043CX15R00J
R428	315-0750-00	B210000		RES,FXD,FILM:75 OHM,5%,0.25W	57668	NTR25J-E75E0
R429	315-0162-00	B010100	B209999	RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
R429	315-0330-00	B210000		RES,FXD,FILM:33 OHM,5%,0.25W	19701	5043CX33R00J
R430	315-0511-00	B210000		RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R431	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R432	315-0242-00	B210000		RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R433	315-0242-00	B010100	B209999	RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R433	311-1228-00	B210000		RES,VAR,NONW:TRMR,10K OHM,0.5W	32997	3386F-T04-103
R435	311-1228-00	B010100	B209999	RES,VAR,NONW:TRMR,10K OHM,0.5W	32997	3386F-T04-103
R435	315-0332-00	B210000		RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
R437	315-0751-00	B010100	B209999	RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
R439	315-0431-00	B010100	B209999	RES,FXD,FILM:430 OHM,5%,0.25W (7B53A ONLY)	19701	5043CX430R0J
R439	315-0431-00	B020000	B209999	RES,FXD,FILM:430 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX430R0J
R440	315-0201-00	B010100	B209999	RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R440	315-0220-00	B210000		RES,FXD,FILM:22 OHM,5%,0.25W	19701	5043CX22R00J
R441	315-0242-00	B010100	B209999	RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R442	315-0431-00	B010100	B209999	RES,FXD,FILM:430 OHM,5%,0.25W (7B53A ONLY)	19701	5043CX430R0J
R442	315-0431-00	B020000	B209999	RES,FXD,FILM:430 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX430R0J
R443	315-0242-00	B010100	B209999	RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
R444	315-0201-00	B010100	B209999	RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R444	315-0220-00	B210000		RES,FXD,FILM:22 OHM,5%,0.25W	19701	5043CX22R00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discount	Name & Description	Mfr. Code	Mfr. Part No.
R445	315-0102-00	B010100	B209999	RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R446	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R447	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R452	317-0271-00	B010100	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W	01121	BB2715
R452	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R452	315-0222-00	B210000		RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
R453	315-0101-00	B210000		RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R454	317-0271-00	B010100	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W	01121	BB2715
R454	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R454	315-0151-00	B210000		RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
R455	315-0222-00	B210000		RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
R456	315-0202-00	B210000		RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R457	317-0751-00	B010100	B169999	RES,FXD,CMPSN:750 OHM,5%,0.125W	01121	BB7515
R457	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R457	315-0103-00	B210000		RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R459	317-0271-00	B010100	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W	01121	BB2715
R459	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W (7B53A ONLY)	19701	5043CX510R0J
R459	317-0102-00	B010100	B019999	RES,FXD,CMPSN:1K OHM,5%,0.125W (7B53AN ONLY)	01121	BB1025
R459	317-0271-00	B020000	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W (7B53AN ONLY)	01121	BB2715
R459	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W (7B53AN ONLY)	19701	5043CX510R0J
R460	315-0201-00	B210000		RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R461	315-0471-00	B010100	B209999	RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R462	315-0103-00	B210000		RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R463	315-0471-00	B010100	B209999	RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R463	315-0821-00	B210000		RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
R464	315-0203-00	B010100	B209999	RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R464	315-0512-00	B210000		RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
R465	315-0432-00	B210000		RES,FXD,FILM:4.3K OHM,5%,0.25W	57668	NTR25J-E04K3
R466	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R466	315-0152-00	B210000		RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
R467	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R468	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R469	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R474	317-0271-00	B010100	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W	01121	BB2715
R474	315-0511-00	B170000	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R475	317-0102-00	B010100	B169999	RES,FXD,CMPSN:1K OHM,5%,0.125W (7B53A ONLY)	01121	BB1025
R475	315-0102-00	B170000	B209999	RES,FXD,FILM:1K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25JE01K0
R475	317-0102-00	B020000	B169999	RES,FXD,CMPSN:1K OHM,5%,0.125W (7B53AN ONLY)	01121	BB1025
R475	315-0102-00	B170000	B209999	RES,FXD,FILM:1K OHM,5%,0.25W (7B53AN ONLY)	57668	NTR25JE01K0
R476	317-0271-00	B010100	B169999	RES,FXD,CMPSN:270 OHM,5%,0.125W	01121	BB2715
R476	315-0271-00	B170000	B209999	RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R477	315-0271-00	B010100	B209999	RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R479	315-0751-00	B010100	B209999	RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
R483	315-0331-00	B010100	B209999	RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R484	315-0511-00	B010100	B209999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R486	315-0361-00	B010100	B209999	RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
R487	315-0620-00	B010100	B209999	RES,FXD,FILM:62 OHM,5%,0.25W	19701	5043CX63R00J
R502	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1
R504	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25W	57668	NTR25J-E39K0
R505	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K200J
R508	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No.		Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Discont			
R509	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
R510	321-0313-00			RES,FXD,FILM:17.8K OHM,1%,0.125W,TC=TO	07716	CEAD17801F
R511	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R513	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
R514	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
R516	321-0231-00			RES,FXD,FILM:2.49K OHM,1%,0.125W,TC=TO	19701	5033ED2K49F
R517	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
R518	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R519	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
R520	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
R521	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
R522	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R523	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R526	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R527	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R528	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
R529	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25W	19701	5043CX8K200J
R533	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
R535	315-0124-00			RES,FXD,FILM:120K OHM,5%,0.25W	19701	5043CX120K0J
R539	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R541	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R542	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
R543	315-0620-00			RES,FXD,FILM:62 OHM,5%,0.25W	19701	5043CX63R00J
R544	315-0241-00	B010100	B241889	RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
R544	315-0271-00	B241890		RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R545	323-0192-00			RES,FXD,FILM:976 OHM,1%,0.5W,TC=TO	19701	5053RD976R0F
R547	321-0146-00			RES,FXD,FILM:324 OHM,1%,0.125W,TC=TO	07716	CEAD324R0F
R548	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
R549	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
R551	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
R553	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
R555	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R556	315-0511-00	B010100	B099999	RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R558	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=TO	19701	5033ED4K990F
R559	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=TO	19701	5033ED10K0F
R561	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R563	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R564	311-1224-00			RES,VAR, NONWW: TRMR, 500 OHM, 0.5W	32997	3386F-T04-501
R565	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25W	57668	NTR25J-E04K3
R566	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
R567	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
R568	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R569	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R570	321-0201-00			RES,FXD,FILM:1.21K OHM,1%,0.125W,TC=TO	19701	5043ED1K210F
R571	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R572	311-1230-00			RES,VAR, NONWW: TRMR, 20K OHM, 0.5W	32997	3386F-T04-203
R574	315-0622-00			RES,FXD,FILM:6.2K OHM,5%,0.25W	19701	5043CX6K200J
R575	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
R576	311-1230-00			RES,VAR, NONWW: TRMR, 20K OHM, 0.5W	32997	3386F-T04-203
R578	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R579	315-0304-00			RES,FXD,FILM:300K OHM,5%,0.25W	57668	NTR25J-E300K
R581	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
R582	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
R583	315-0563-00			RES,FXD,FILM:56K OHM,5%,0.25W	19701	5043CX56K00J
R584	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R589	315-0621-00			RES,FXD,FILM:620 OHM,5%,0.25W	57668	NTR25J-E620E
R590	315-0820-00			RES,FXD,FILM:82 OHM,5%,0.25W	57668	NTR25J-E82E0
R591	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discnt	Name & Description	Mfr. Code	Mfr. Part No.
R592	311-1235-00			RES,VAR,NONW:100K OHM,0.5W	32997	3386F-T04-104
R597	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
R601	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
R603	315-0361-00			RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
R604	322-0210-00			RES,FXD,FILM:1.50K OHM,1%,0.25W,TC=TO	75042	CEB70-1501F
R606	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
R607	315-0620-00			RES,FXD,FILM:62 OHM,5%,0.25W	19701	5043CX63R00J
R608	321-0164-00			RES,FXD,FILM:499 OHM,1%,0.125W,TC=TO	19701	5033ED499ROF
R609	315-0511-00	B080000		RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R610	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
R611	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R612	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R613	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R614	315-0102-00	B010100	B059999	RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R614	321-0148-00	B060000		RES,FXD,FILM:340 OHM,1%,0.125W,TC=TO	07716	CEAD340ROF
R615	315-0910-00			RES,FXD,FILM:91 OHM,5%,0.25W	19701	5043CX91R00J
R616	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R617	315-0683-00			RES,FXD,FILM:68K OHM,5%,0.25W	57668	NTR25J-E68K0
R618	315-0102-00	B080000		RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R619	315-0623-00			RES,FXD,FILM:62K OHM,5%,0.25W	19701	5043CX62K00J
R621	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
R622	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R624	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
R626	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
R627	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
R628	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
R629	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
R631	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
R634	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2
R635	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
R637	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R638	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R639	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R641	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R642	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R644	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R645	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R647	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
R648	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
R649	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	57668	NTR25J-E06K8
R651	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
R652	311-1225-00			RES,VAR,NONW:TRMR,1K OHM,0.5W	32997	3386F-T04-102
R653	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
R655	315-0201-00	B080000		RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
R657	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
R658	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
R659	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R660	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
R661	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
R662	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
R663	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
R665	315-0431-00	B010100	B079999	RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
R665	315-0271-00	B080000		RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
R666	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
R668	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	57668	NTR25J-E07K5
R669	315-0162-00			RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
R670	315-0471-00			RES,FXD,FILM:470 OHM,5%,0.25W	57668	NTR25J-E470E
R672	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No.		Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Dscont			
R673	315-0102-00			RES, FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R675	311-1235-00			RES, VAR, NONMW: 100K OHM, 0.5W	32997	3386F-T04-104
R676	315-0433-00			RES, FXD, FILM: 43K OHM, 5%, 0.25W	19701	5043CX43K00J
R677	315-0820-00			RES, FXD, FILM: 82 OHM, 5%, 0.25W	57668	NTR25J-E82E0
R679	315-0621-00			RES, FXD, FILM: 620 OHM, 5%, 0.25W	57668	NTR25J-E620E
R680	315-0103-00			RES, FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R681	315-0623-00			RES, FXD, FILM: 62K OHM, 5%, 0.25W	19701	5043CX62K00J
R682	315-0303-00			RES, FXD, FILM: 30K OHM, 5%, 0.25W	19701	5043CX30K00J
R683	315-0102-00			RES, FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R684	321-0192-00			RES, FXD, FILM: 976 OHM, 1%, 0.125W, TC=TO	19701	5033ED976ROF
R685	315-0510-00			RES, FXD, FILM: 51 OHM, 5%, 0.25W	19701	5043CX51R00J
R686	301-0133-00			RES, FXD, FILM: 13K OHM, 5%, 0.5W	57668	TR50J-E13K
R687	315-0510-00			RES, FXD, FILM: 51 OHM, 5%, 0.25W	19701	5043CX51R00J
R689	315-0102-00			RES, FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R690	315-0752-00			RES, FXD, FILM: 7.5K OHM, 5%, 0.25W	57668	NTR25J-E07K5
R691	321-0260-00			RES, FXD, FILM: 4.99K OHM, 1%, 0.125W, TC=TO	19701	5033ED4K990F
R692	321-0268-00			RES, FXD, FILM: 6.04K OHM, 1%, 0.125W, TC=TO	19701	5043ED6K040F
R693	321-0268-00			RES, FXD, FILM: 6.04K OHM, 1%, 0.125W, TC=TO	19701	5043ED6K040F
R694	321-0260-00			RES, FXD, FILM: 4.99K OHM, 1%, 0.125W, TC=TO	19701	5033ED4K990F
R695	315-0391-00			RES, FXD, FILM: 390 OHM, 5%, 0.25W	57668	NTR25J-E390E
R696	315-0242-00			RES, FXD, FILM: 2.4K OHM, 5%, 0.25W	57668	NTR25J-E02K4
R697	315-0391-00			RES, FXD, FILM: 390 OHM, 5%, 0.25W	57668	NTR25J-E390E
R698	315-0102-00			RES, FXD, FILM: 1K OHM, 5%, 0.25W	57668	NTR25JE01K0
R701	321-0222-07			RES, FXD, FILM: 2.0K OHM, 0.1%, 0.125W, TC=T9	19701	5033RE2K000B
R704	321-0222-07			RES, FXD, FILM: 2.0K OHM, 0.1%, 0.125W, TC=T9	19701	5033RE2K000B
R706	315-0103-00			RES, FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R707	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R710	321-0327-00			RES, FXD, FILM: 24.9K OHM, 1%, 0.125W, TC=TO	07716	CEAD24901F
R711	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R713	321-0452-00			RES, FXD, FILM: 499K OHM, 1%, 0.125W, TC=TO	19701	5043ED499K0F
R714	321-0356-00			RES, FXD, FILM: 49.9K OHM, 1%, 0.125W, TC=TO	19701	5033ED49K90F
R716	321-0356-00			RES, FXD, FILM: 49.9K OHM, 1%, 0.125W, TC=TO	19701	5033ED49K90F
R717	321-0268-00			RES, FXD, FILM: 6.04K OHM, 1%, 0.125W, TC=TO	19701	5043ED6K040F
R720	321-0174-00			RES, FXD, FILM: 634 OHM, 1%, 0.125W, TC=TO	07716	CEAD634ROF
R722	315-0103-00			RES, FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R723	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R725	321-0327-00			RES, FXD, FILM: 24.9K OHM, 1%, 0.125W, TC=TO	07716	CEAD24901F
R726	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R728	315-0103-00			RES, FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R729	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R731	315-0273-00			RES, FXD, FILM: 27K OHM, 5%, 0.25W	57668	NTR25J-E27K0
R732	315-0104-00			RES, FXD, FILM: 100K OHM, 5%, 0.25W	57668	NTR25J-E100K
R734	315-0511-00			RES, FXD, FILM: 510 OHM, 5%, 0.25W	19701	5043CX510R0J
R736	315-0103-00			RES, FXD, FILM: 10K OHM, 5%, 0.25W	19701	5043CX10K00J
R738	321-0225-00			RES, FXD, FILM: 2.15K OHM, 1%, 0.125W, TC=TO	19701	5033ED2K15F
R739	321-0132-00			RES, FXD, FILM: 232 OHM, 1%, 0.125W, TC=TO	19701	5043ED232ROF
R741	321-0260-00			RES, FXD, FILM: 4.99K OHM, 1%, 0.125W, TC=TO	19701	5033ED4K990F
R745	315-0621-00			RES, FXD, FILM: 620 OHM, 5%, 0.25W	57668	NTR25J-E620E
R747	321-0207-00			RES, FXD, FILM: 1.40K OHM, 1%, 0.125W, TC=TO	19701	5033ED1K400F
R748	321-0186-00			RES, FXD, FILM: 845 OHM, 1%, 0.125W, TC=TO	19701	5043ED845ROF
R750	321-0220-00			RES, FXD, FILM: 1.91K OHM, 1%, 0.125W, TC=TO	19701	5033ED1K91F
R751	321-0236-00			RES, FXD, FILM: 2.80K OHM, 1%, 0.125W, TC=TO	07716	CEAD28000F
R753	315-0912-00			RES, FXD, FILM: 9.1K OHM, 5%, 0.25W	57668	NTR25J-E09K1
R757	321-0164-00			RES, FXD, FILM: 499 OHM, 1%, 0.125W, TC=TO	19701	5033ED499ROF
R759	321-0148-00			RES, FXD, FILM: 340 OHM, 1%, 0.125W, TC=TO	07716	CEAD340ROF
R761	321-0057-00			RES, FXD, FILM: 38.3 OHM, 0.5%, 0.125W, TC=TO	91637	CMF55116G38R30F
R762	311-1221-00			RES, VAR, NONMW: TRMR, 50 OHM, 0.5W	32997	3386F-T04-500
R764	308-0300-00			RES, FXD, WW: 1.75K OHM, 1%, 3W	00213	1240S-1750-1

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Name & Description	Mfr. Code	Mfr. Part No.
R766	321-0148-00			RES,FXD,FILM:340 OHM,1%,0.125W,TC=TO	07716	CEAD340ROF
R768	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
R770	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25W	57668	NTR25J-E04K3
R772	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	57668	NTR25J-E03K0
R774	321-0153-00			RES,FXD,FILM:383 OHM,1%,0.125W,TC=TO	07716	CEAD383ROF
R901	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R903	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R905	321-0344-00			RES,FXD,FILM:37.4K OHM,1%,0.125W,TC=TO (7B53A ONLY)	19701	5033ED 37K40F
R907	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R909	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R911	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R913	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R915	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R917	321-0344-00			RES,FXD,FILM:37.4K OHM,1%,0.125W,TC=TO (7B53A ONLY)	19701	5033ED 37K40F
R919	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R921	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R923	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R925	321-0344-00			RES,FXD,FILM:37.4K OHM,1%,0.125W,TC=TO (7B53A ONLY)	19701	5033ED 37K40F
R926	321-0344-00			RES,FXD,FILM:37.4K OHM,1%,0.125W,TC=TO (7B53A ONLY)	19701	5033ED 37K40F
R927	315-0151-00	B150000		RES,FXD,FILM:150 OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150E
R928	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E51K0
R929	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E51K0
R931	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R932	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R934	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R935	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R937	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R938	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R940	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R941	315-0753-00			RES,FXD,FILM:75K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E75K0
R943	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
R944	315-0154-00			RES,FXD,FILM:150K OHM,5%,0.25W (7B53A ONLY)	57668	NTR25J-E150K
S4	-----			(PART OF R4)		
S5	-----			(PART OF R5)		
S10	-----			(PART OF A2)		

Replaceable Electrical Parts - 7B53A/7B53AN

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
S20	-----			(PART OF A3)		
S30	-----			(PART OF A5)		
S40	260-1133-00			SWITCH,PUSH:DP,1A,25VDC,3 BUTTON	31918	ORDER BY DESCR
S41	-----			(PART OF S40)		
S42	-----			(PART OF S40)		
S100	263-1099-00			SW CAM ACTR AS:TIME/DIV	80009	263-1099-00
				(7B53A ONLY)		
S100	105-0326-00			ACTR ASSY,CAM S:TIME/CM	80009	105-0326-00
				(7B53AN ONLY)		
S144	-----			(PART OF R144)		
S251	260-0960-01			SWITCH,SLIDE:FORM Z,0.5A,120VDC,BLACK BTTN	10389	23-021-043
S252	260-1309-00			SWITCH,SENS:SPDT,5A,250AC,MOM	01963	E63-10H
S262	260-0960-01			SWITCH,SLIDE:FORM Z,0.5A,120VDC,BLACK BTTN	10389	23-021-043
S762	260-1208-00			SWITCH,PUSH:DPDT,28VDC,PUSH-PUSH	31918	ORDER BY DESCR
U350	156-0205-00	B010100	B209999	MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	80009	156-0205-00
U350	155-0109-01	B210000		MICROCKT,LINEAR:MONOLITHIC TRIG	80009	155-0109-01
U355	156-0205-00	B010100	B209999	MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	80009	156-0205-00
U375	156-0204-01	B010100	B209999	MICROCKT,DGTL:DUAL CLOCK LATCH W/CUT LD	80009	156-0204-01
				(7B53A ONLY)		
U375	156-0204-00	B010100	B019999	MICROCKT,DGTL:ECL,DUAL CLOCK LATCH	52648	SP1669B
				(7B53AN ONLY)		
U375	156-0204-01	B020000	B209999	MICROCKT,DGTL:DUAL CLOCK LATCH W/CUT LD	80009	156-0204-01
				(7B53AN ONLY)		
U450	156-0205-00	B010100	B209999	MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	80009	156-0205-00
U450	155-0109-01	B210000		MICROCKT,LINEAR:MONOLITHIC TRIG	80009	155-0109-01
U455	156-0205-00	B010100	B209999	MICROCKT,DGTL:ECL,QUAD 2-INPUT NOR GATE	80009	156-0205-00
U475	156-0204-00	B010100	B209999	MICROCKT,DGTL:ECL,DUAL CLOCK LATCH	52648	SP1669B
U520	155-0049-01	B010100	B185439	MICROCKT,DGTL:W/LOCKOUT DSBL FCTN	80009	155-0049-01
U520	155-0049-02	B185440		MICROCKT,DGTL:SWEEP CONTROL,W/LOCKOUT	80009	155-0049-02
				DISABLE FUNCTION		
U580	155-0042-03	B010100	B191179	MICROCKT,LINEAR:MILLER INTEGRATOR	80009	155-0042-03
U580	155-0028-00	B191180		MICROCKT,LINEAR:MILLER INTEGRATOR	80009	155-0028-00
U650	155-0042-03	B010100	B191179	MICROCKT,LINEAR:MILLER INTEGRATOR	80009	155-0042-03
U650	155-0028-00	B191180		MICROCKT,LINEAR:MILLER INTEGRATOR	80009	155-0028-00
U720	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY	02735	CA3046
U744	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY	02735	CA3046
VR320	152-0149-00	B010100	B209999	SEMICON DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
VR420	152-0149-00	B010100	B209999	SEMICON DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
VR570	152-0461-00			SEMICON DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZG25002K2
VR708	152-0227-00			SEMICON DVC,DI:ZEN,SI,6.2V,5%,0.4W,DO-7	04713	SZ13903
W654	131-0566-00	B241890		BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966 Drafting Practices.
 Y14.2, 1973 Line Conventions and Lettering.
 Y10.5, 1968 Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
 1430 Broadway
 New York, New York 10018

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

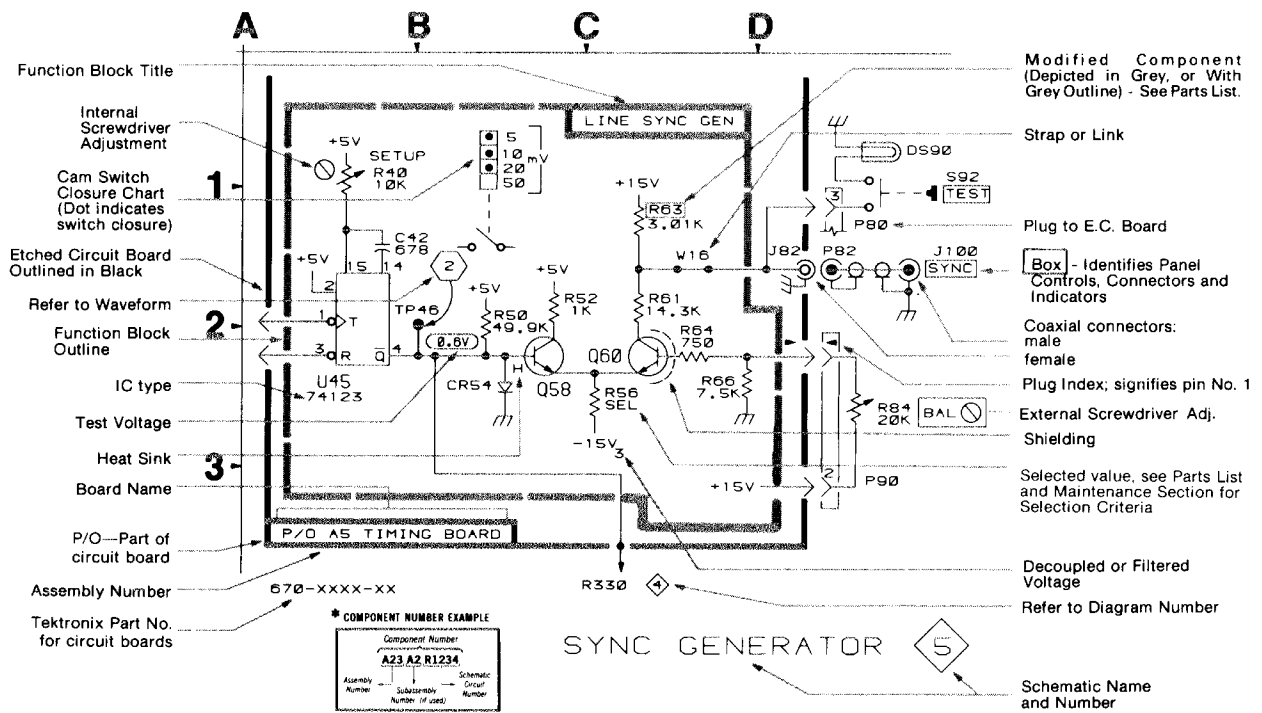
Capacitors = Values one or greater are in picofarads (pF).
 Values less than one are in microfarads (μ F).
 Resistors = Ohms (Ω).

The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

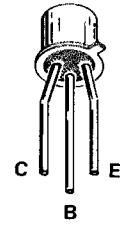
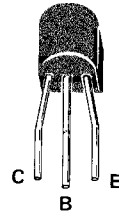
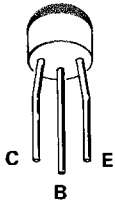
Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.

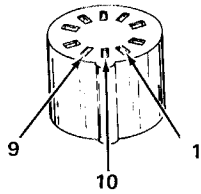
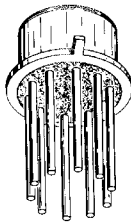


Transistors

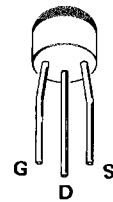
NOTE
LEAD CONFIGURATIONS AND CASE STYLES ARE TYPICAL, BUT MAY VARY DUE TO VENDOR CHANGES OR INSTRUMENT MODIFICATIONS.



Integrated Circuit



Field Effect Transistors (FET)



Integrated Circuits

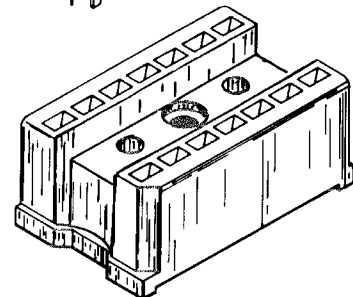
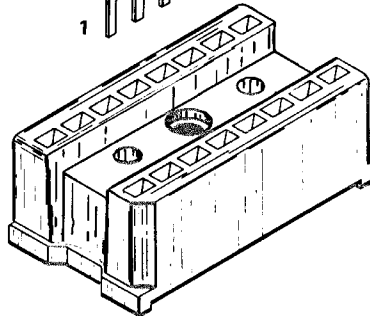
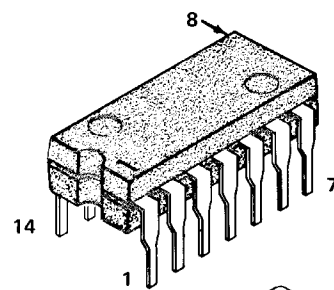
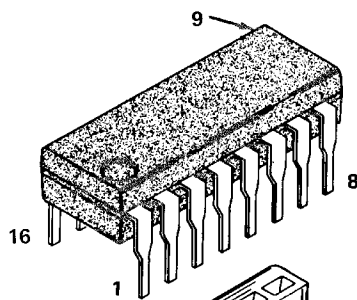
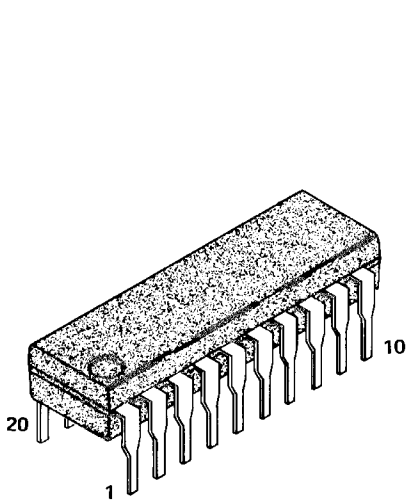
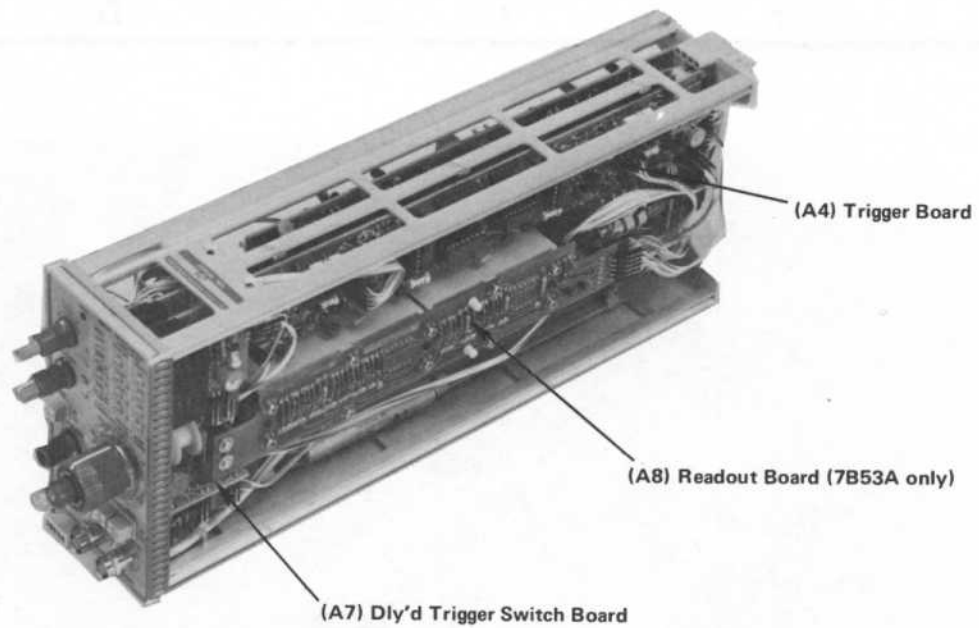
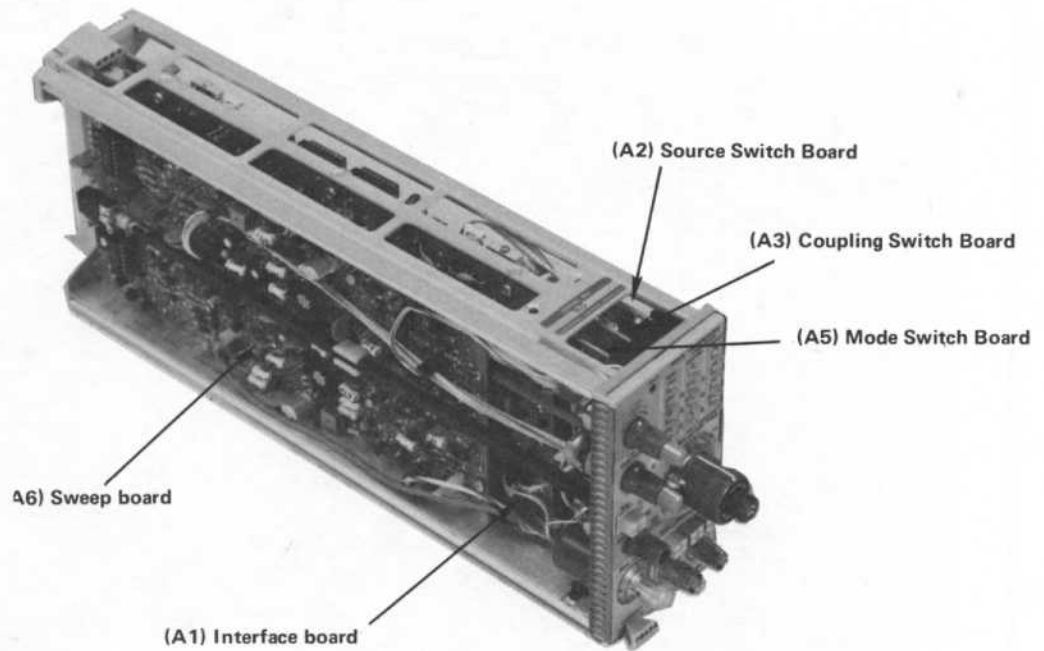


Fig. 8-1. Electrode configuration for semiconductors in this instrument.



1342-75

Fig. 8-2. Location of circuit boards in the 7B53A/7B53AN.

7/0 A1, A2, A3
Fig. 8-3 thru 8-6

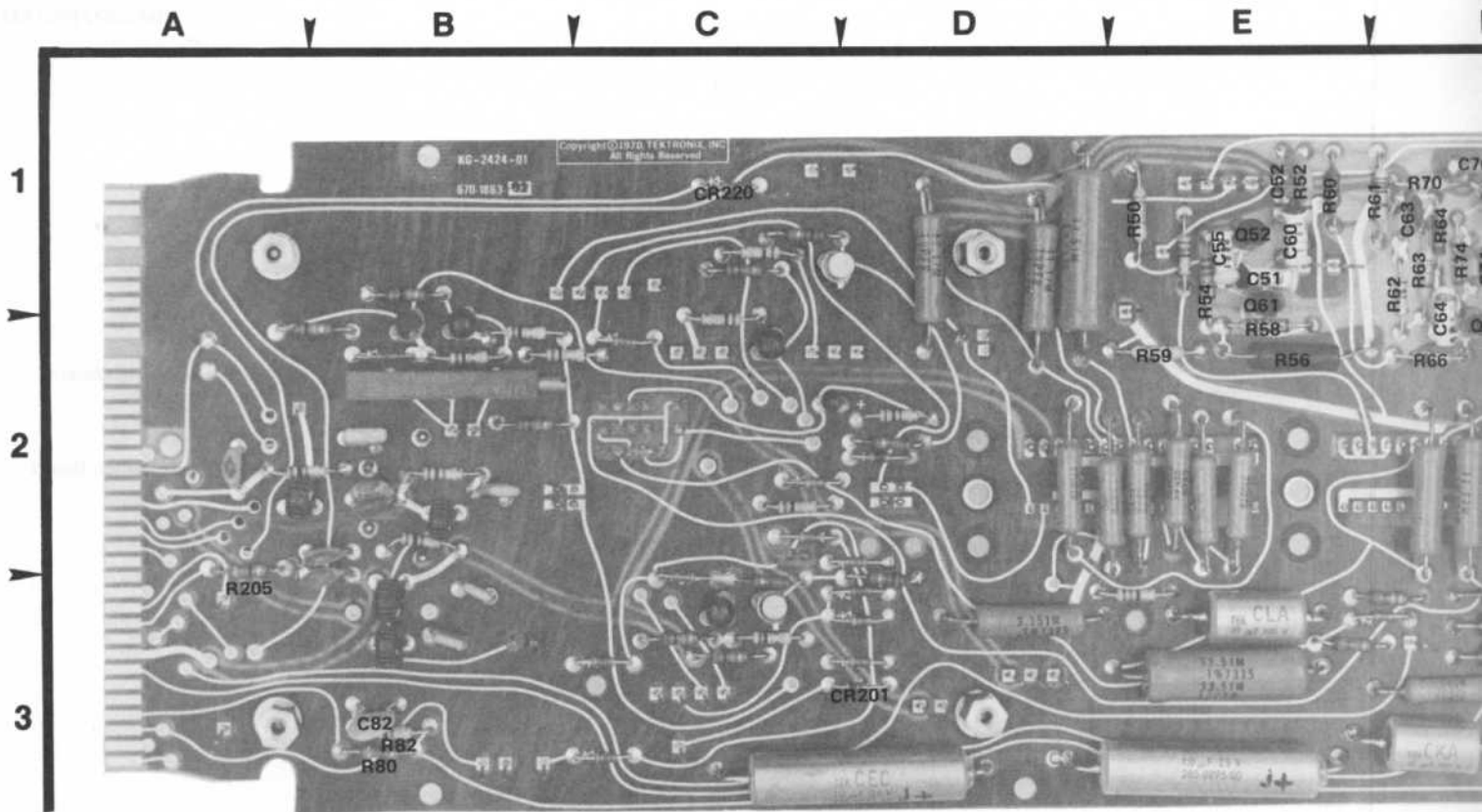


Fig. 8-3. Partial A1-Interface circuit board component locator (SN B090000 and up).

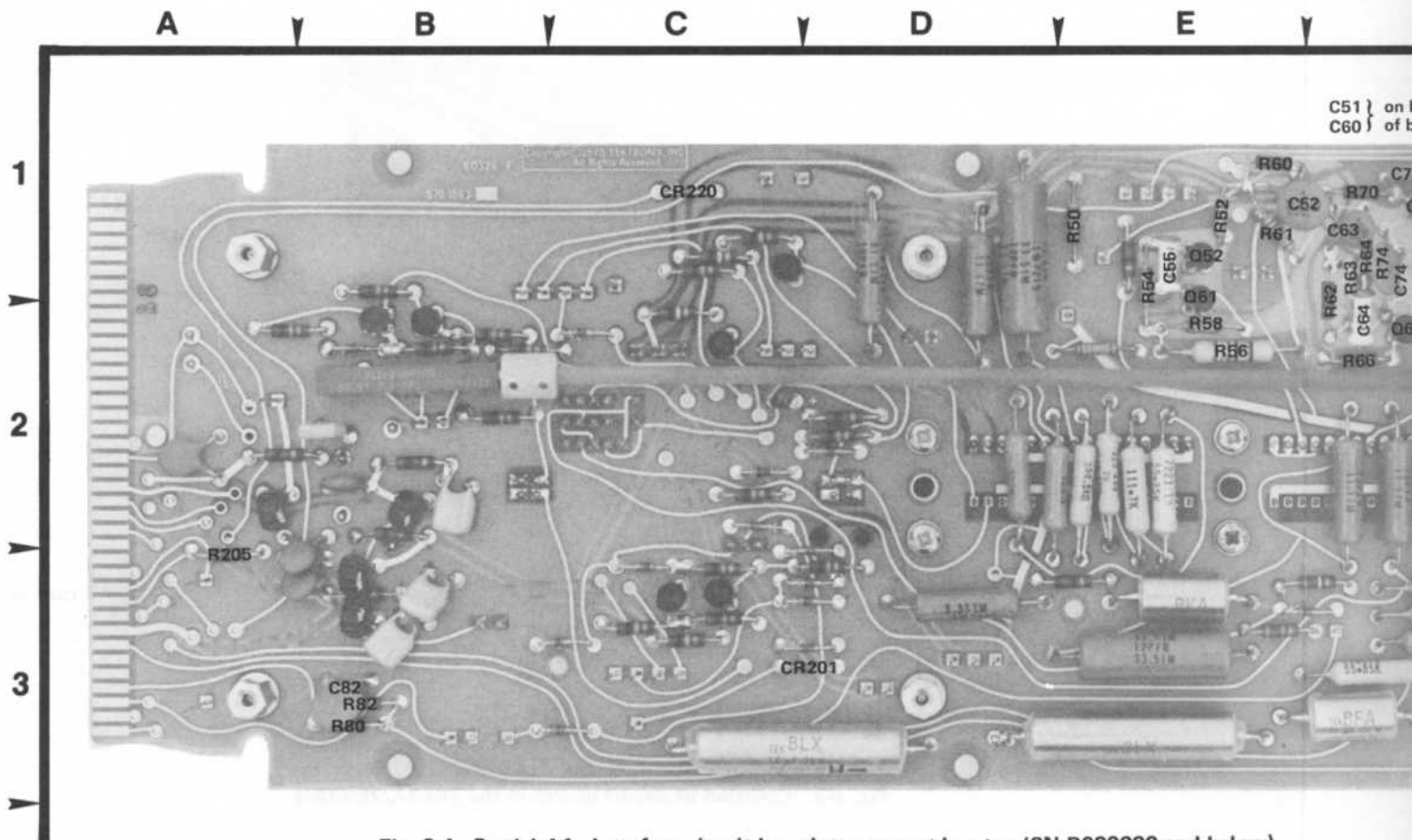


Fig. 8-4. Partial A1-Interface circuit board component locator (SN B089999 and below),

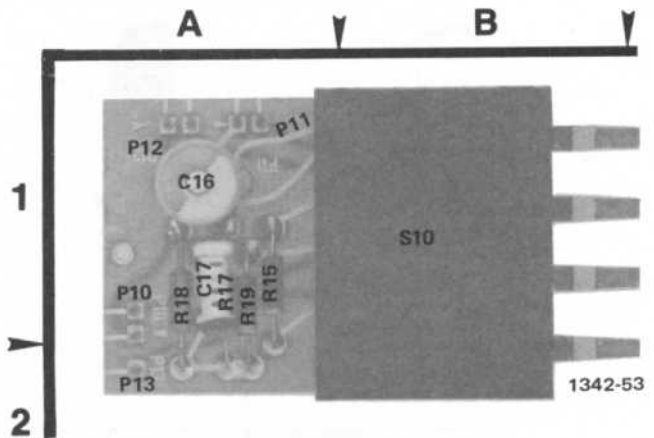
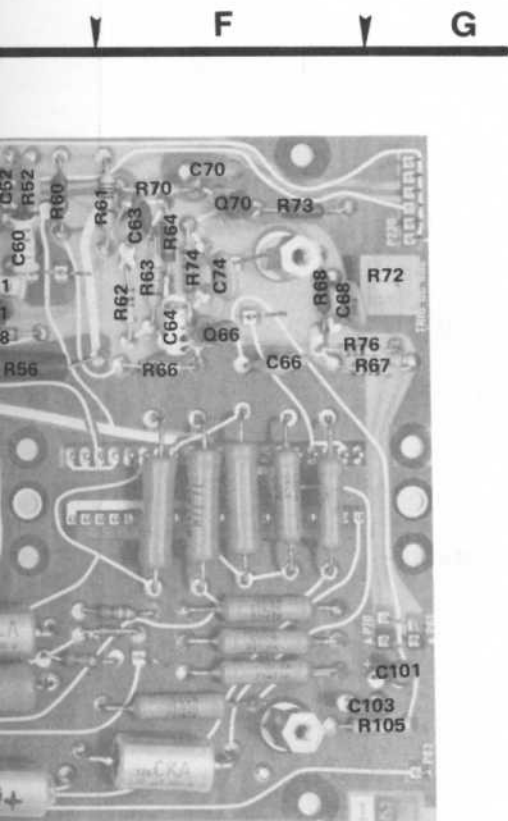
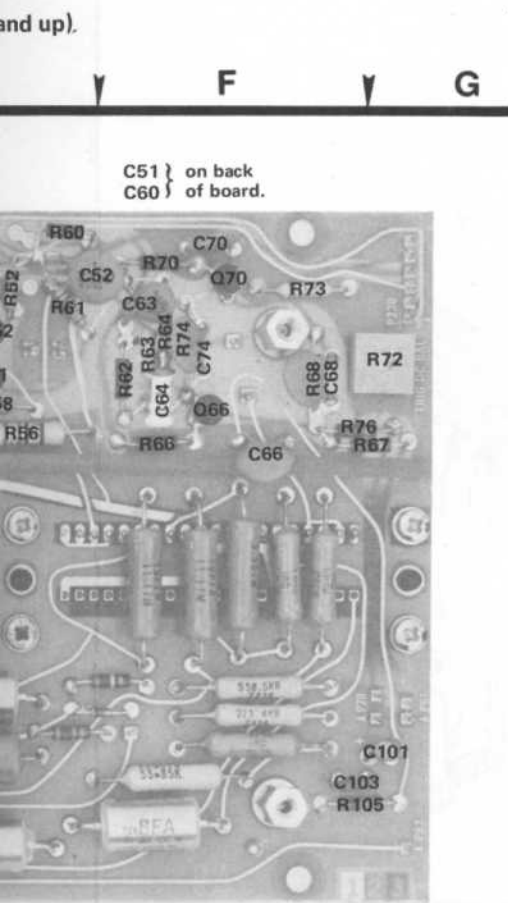


Fig. 8-5. A2—Source Switch circuit board component locator.



1342-51

Static Sensitive Devices
See Maintenance Section

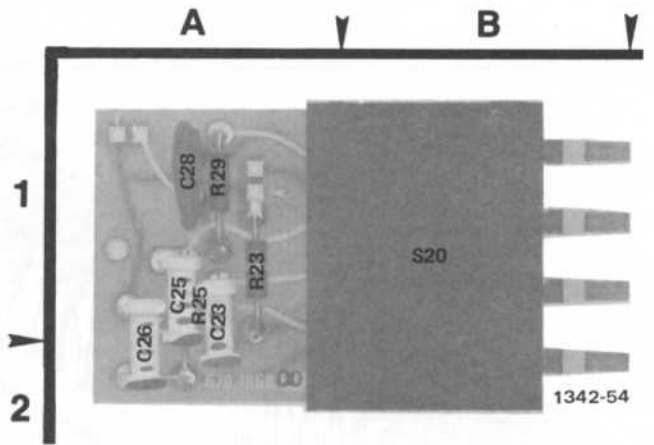





Fig. 8-6. A3—Coupling Switch circuit board component locator.

1342-52

below),

P/O A1 ASSY (SN B010000 & up)			Main Trigger Preamp 		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C51*	B2	E1	R61	B4	E1
C52	B1	E1	R62	C4	F2
C55	B3	E1	R63	C4	F1
C60*	B4	E1	R64	C4	F1
C63	C4	F1	R66	C4	F2
C64	C4	F2	R67	D4	G2
C66	D3	F2	R68	C5	F1
C68	D5	F1	R70	C5	F1
C70	D6	F1	R72	C6	G1
C74	C5	F1	R73	C5	F1
C82	C6	B3	R74	C5	F1
			R76	D5	G2
Q52	B2	E1	R80	C6	A3
Q61	B4	E2	R82	C6	A3
Q66	C4	F2			
Q70	C5	F1	TP50 **	A2	C1
			TP59 **	A4	C1
R50	A2	E1			
R52	B2	E1			
R54	B3	E1	C2	E3	CHASSIS
R56	A3	E2			
R58	A3	E2	R1	E3	CHASSIS
R59	A4	E2	R2	E3	CHASSIS
R60	B3	E1			
A2 ASSY			Main Trigger Preamp 		
C16	F3	A1	R15	F4	A1
C17	F4	A1	R17	F3	A1
			R18	G4	A1
P10	E5	A1	R19	F4	A1
P11	E3	A1			
P12	G4	A1	S10	F7	B1
P13	E6	A2			
A3 ASSY			Main Trigger Preamp 		
C23	G4	A1	R23	G3	A1
C25	H4	A1	R25	H4	A1
C26	H4	A1	R29	A1	A1
C28	H5	A1	S20	G5	B1

* Location of parts for SN B089999 & below
on back of board (F1)

** TP50 and TP59 located on 7B53A only.

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base Unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-loading digital multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Extender	Required for extending the 7B53AN from the mainframe when making waveform and voltage measurements.	Tektronix extender plug-in. Tektronix Part Number 067-0589-00 or Tektronix flexible extender, Tektronix Part Number 067-0616-00, or equivalent.

Voltage Conditions

The 7B53AN Unit under test must be connected to a mainframe separate from the test oscilloscope. No signal is applied for voltage measurements. Voltmeter common is connected to chassis ground.

DELAY TIME MULT	5.00
MAG	X1
POSITION	Center display horizontally
DLY'D TRIG	
LEVEL	Control center
SLOPE	(+)
COUPLING	AC
SOURCE	INT

7B53AN Control Settings

MAIN TRIGGERING

MODE	AUTO
COUPLING	AC
SOURCE	INT
SLOPE	(+)
LEVEL	Control center
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms (press in for DLY'D display mode)
VARIABLE	CAL (pull out for MIXED display mode)

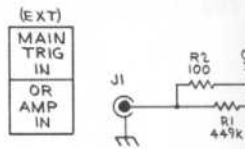
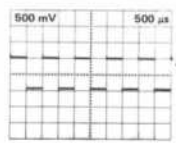
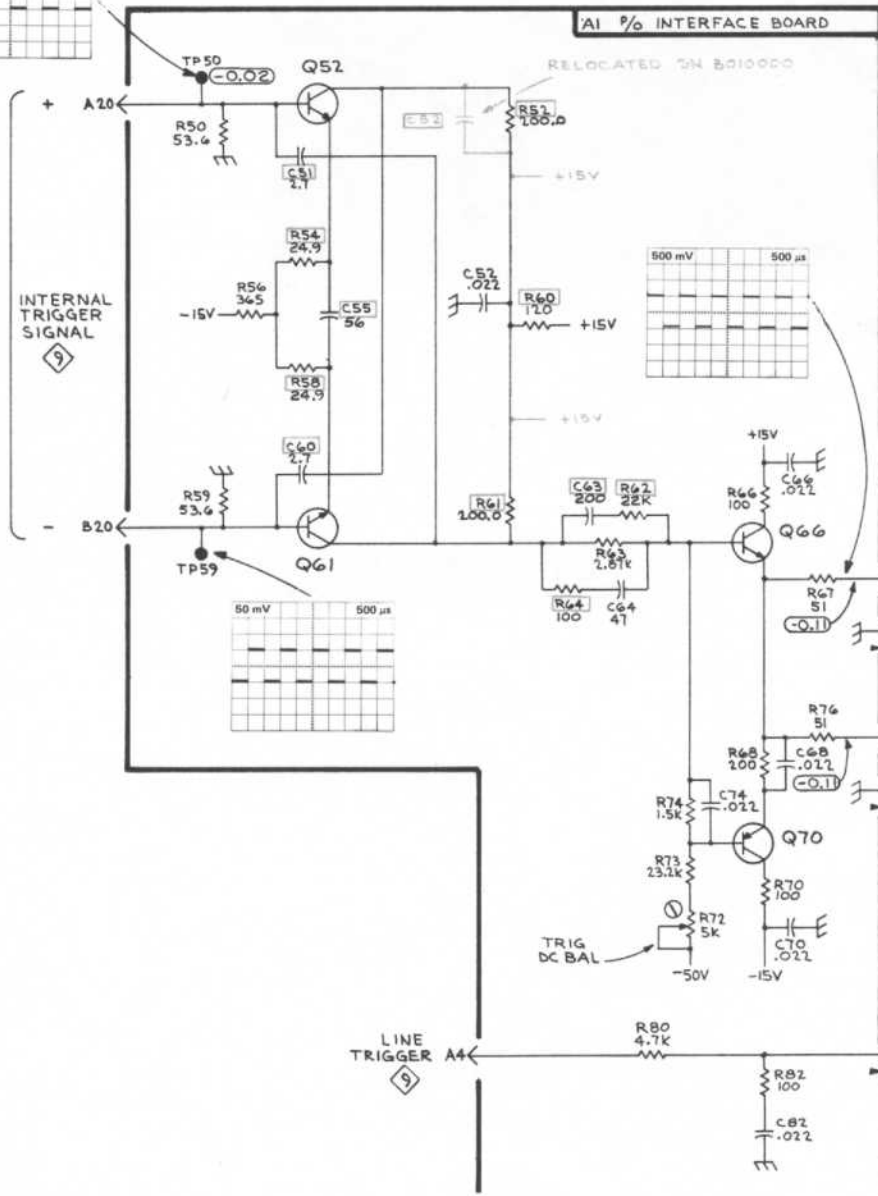
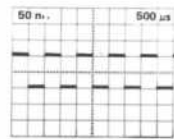
Waveform Conditions

Front panel controls are set the same as for voltage measurements. The test oscilloscope 0.4 Volt calibration signal is applied to the vertical amplifier of the mainframe to which the 7B53AN is connected. The vertical amplifier of the system under test is set for 100 mV/Division. The test oscilloscope is triggered from the calibration signal; vertical input is AC coupled.

Tolerances of voltages and waveforms shown are ±20%.

A B C D E

1
2
3
4
5
6
7
8



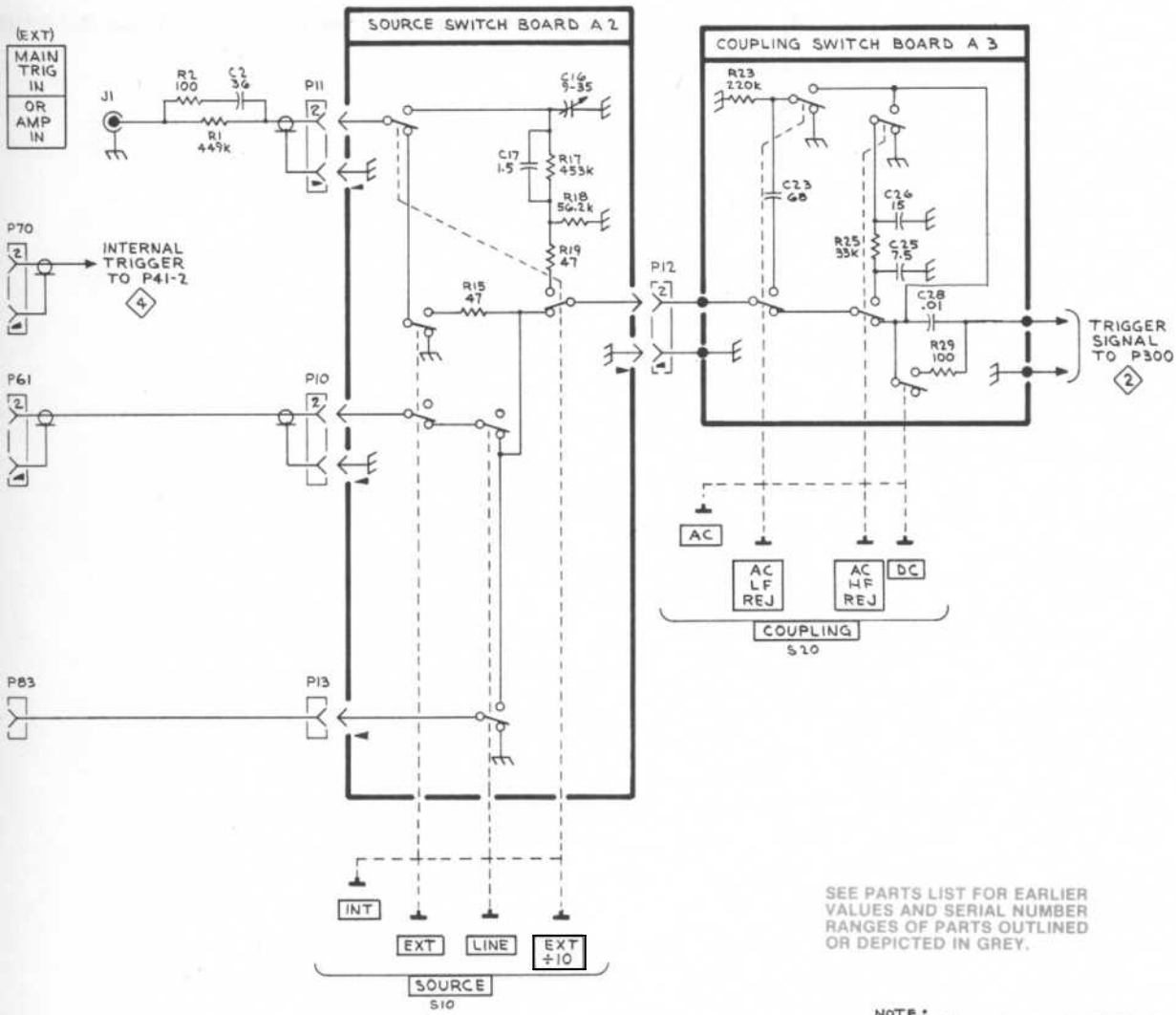
E

F

G

H

J



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

NOTE: P/O INDICATES PART OF

⊗ Static Sensitive Devices
See Maintenance Section

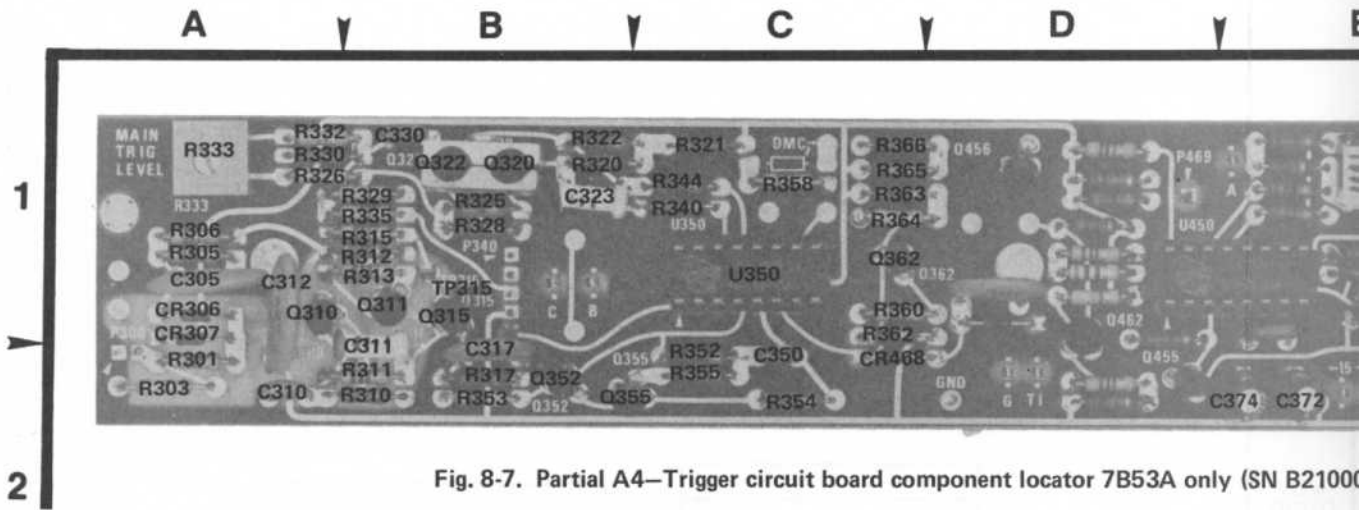
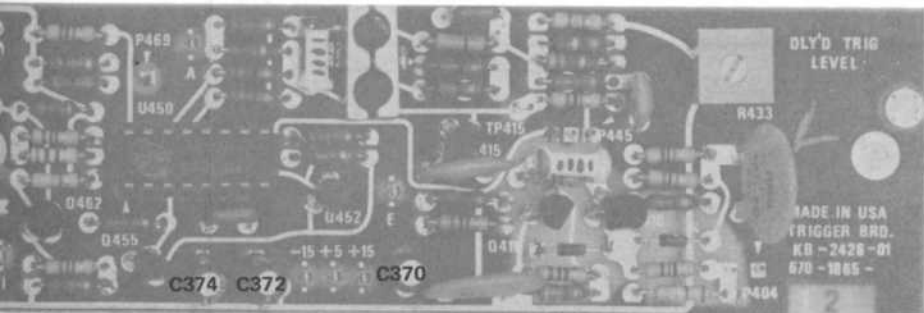


Fig. 8-7. Partial A4-Trigger circuit board component locator 7B53A only (SN B21000 & UP)

P/O A4, (SN B210000 & UP)
Fig. 8-7

D E F G



1342-55

Indicator 7B53A only (SN B210000 and up).



Static Sensitive Devices
See Maintenance Section

P/O A4 ASSY

Main Trigger Generator
(SN B210000 & Up)

2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C305	C7	A1	R313	D6	B1
C310	D4	A2	R315	E5	B1
C311	D5	B2	R317	E6	B2
C312	E7	A1	R320	F4	B1
C317	E6	B2	R321	F4	C1
C323	F4	B1	R322	H4	B1
C330	K5	B1	R325	F5	B1
C350	K1	C2	R326	F6	A1
C370	B1	E2	R328	H5	B1
C372	B2	E2	R329	K5	B1
C374	B2	E2	R330	L5	A1
CR306	C6	A1	R332	L4	A1
CR307	C4	A1	R333	L4	A1
P300	B4	A2	R335	M5	D1
P340	M3	B1	R340	F4	C1
Q310	D4	A1	R344	H4	C1
Q311	D5	B1	R352	K2	C2
Q315	E5	B1	R353	L3	B2
Q320	F5	B1	R354	L2	C2
Q322	H5	B1	R355	M2	C2
Q352	L2	B2	R358	H2	C1
Q355	L2	B2	R360	B3	C1
Q362	D3	C1	R362	C3	C2
R301	C4	A2	R363	D2	C1
R303	B5	A2	R364	E3	C1
R305	C7	A1	R365	C3	C1
R306	D7	A1	R366	D3	C1
R310	D4	B2	TP315	E5	B1
R311	D5	B2	U350	J2	C1
R312	D6	B1	P300	B4	CHASSIS
			R4	N5	CHASSIS
			S4	N5	CHASSIS

A | B | C | D | E | F | H

1

2

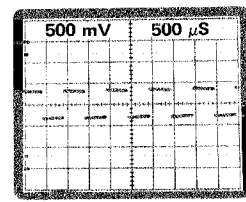
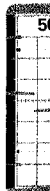
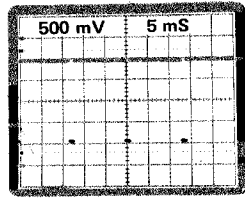
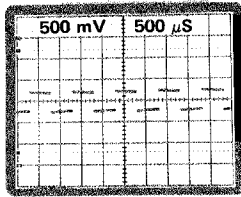
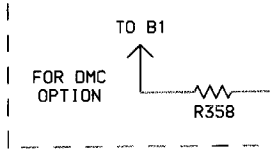
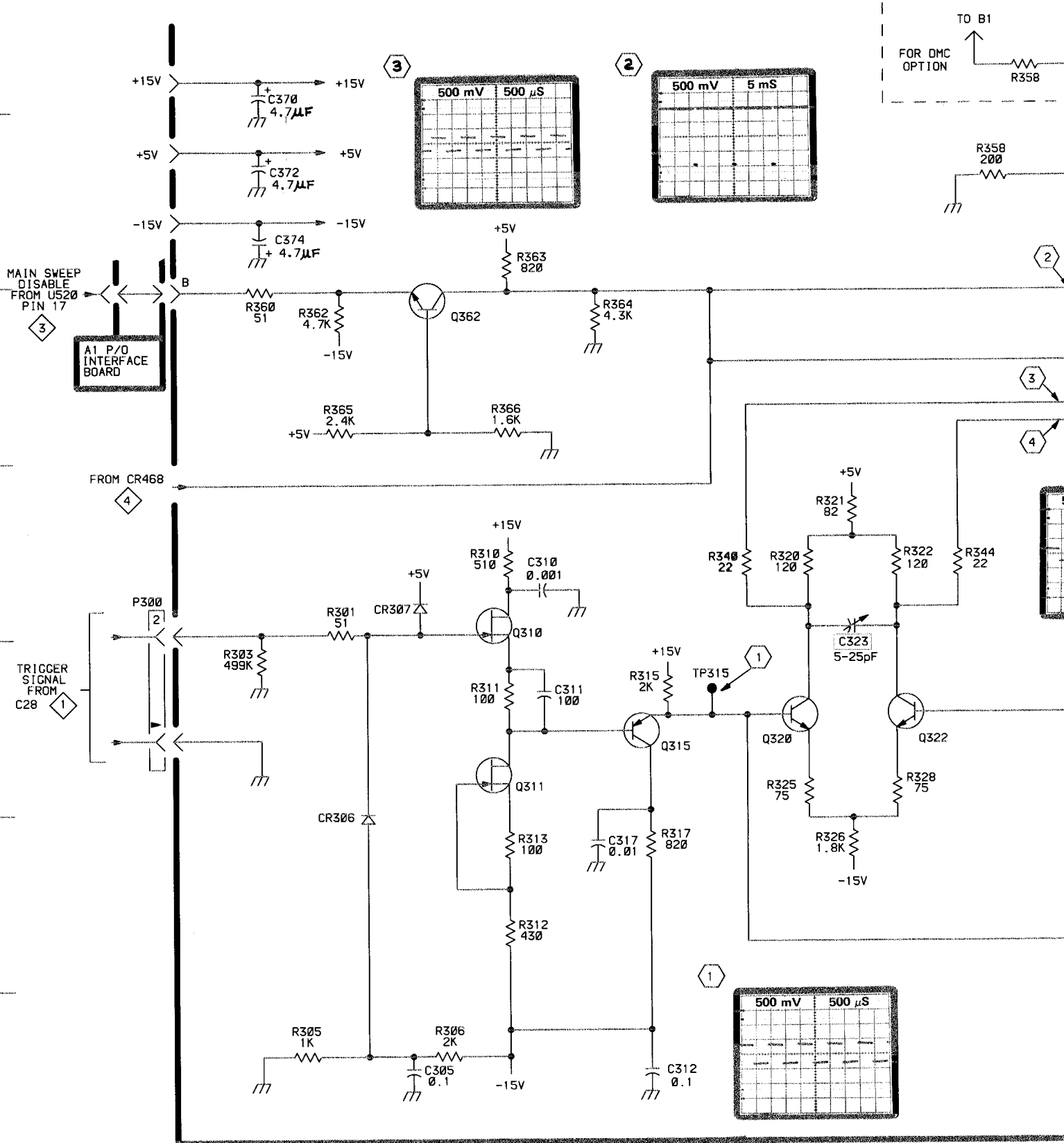
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4

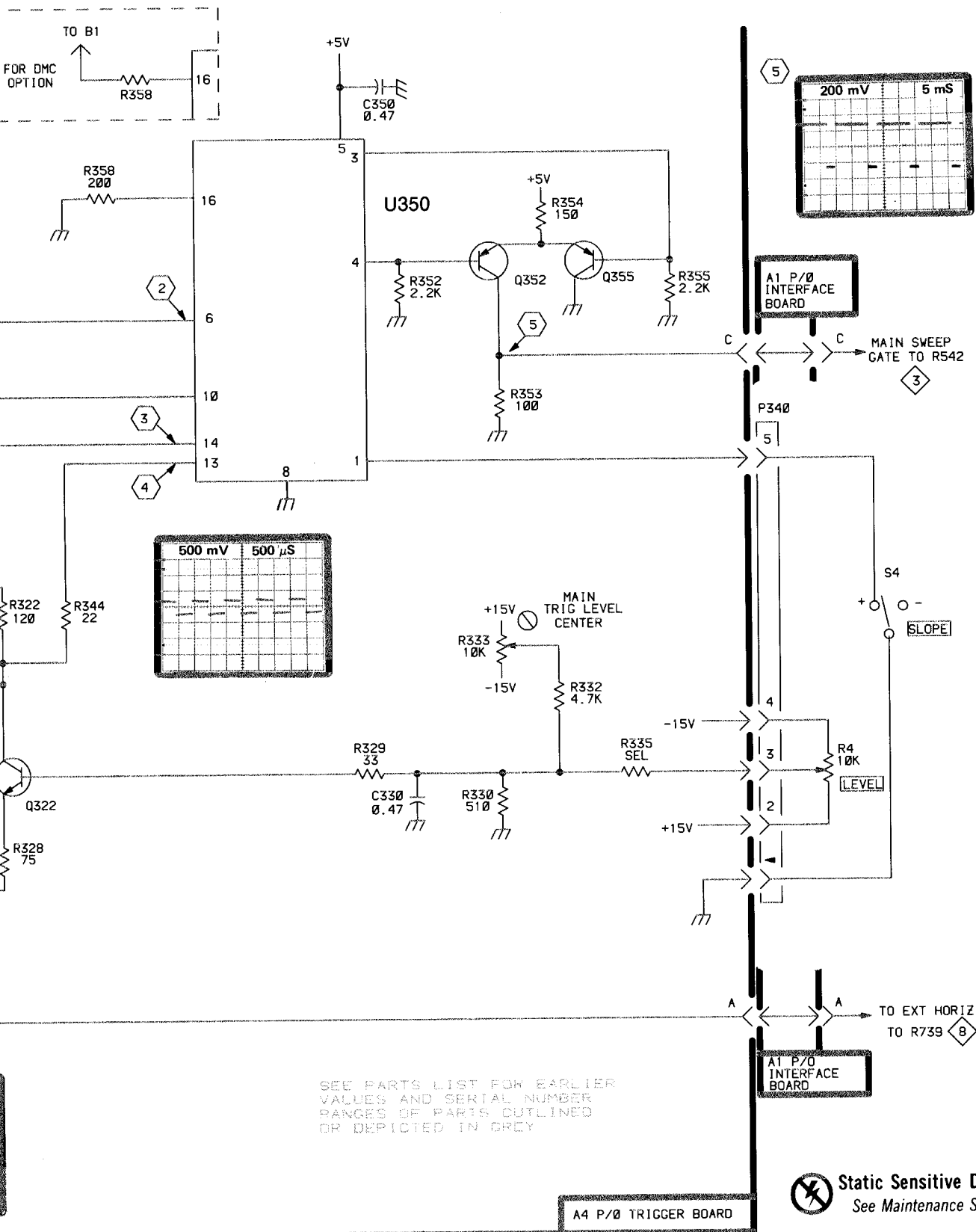
5

6

7



H | J | K | L | M | N |



MAIN TRIGGER GENERATOR
SN B210000 & UP

MAIN TRIGGER GENERATOR
(SN B210000 & UP)

2

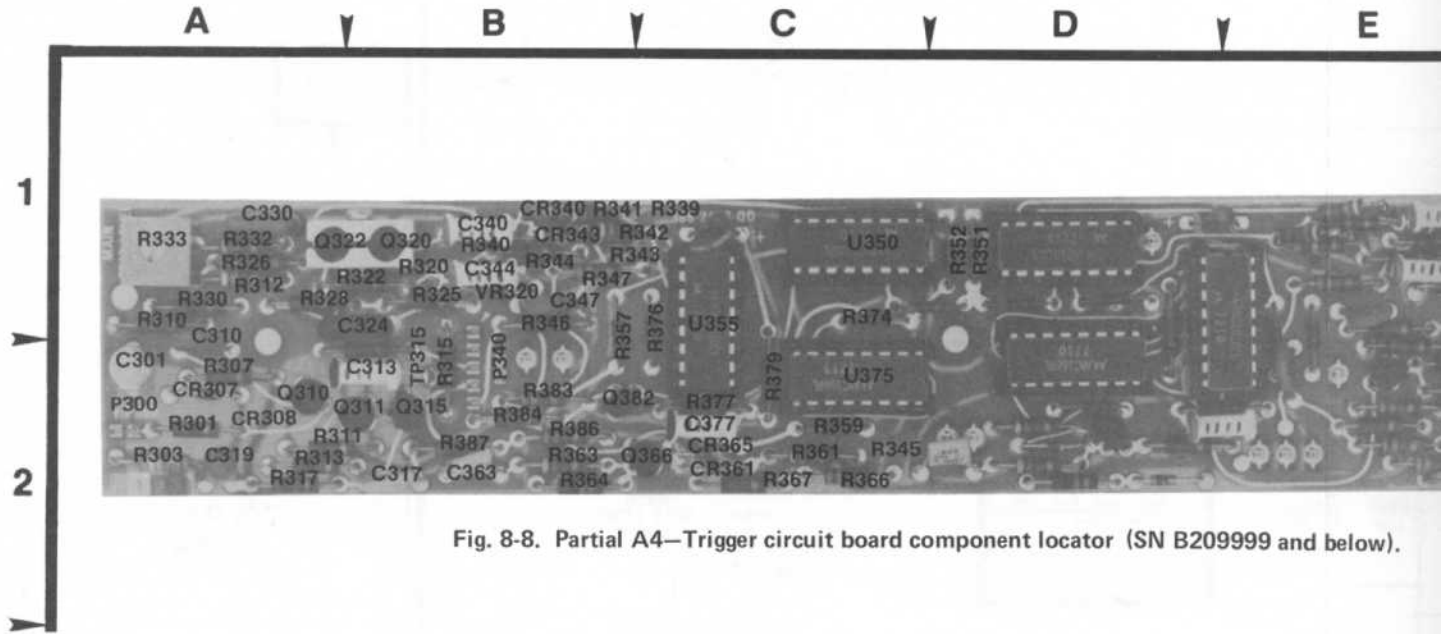
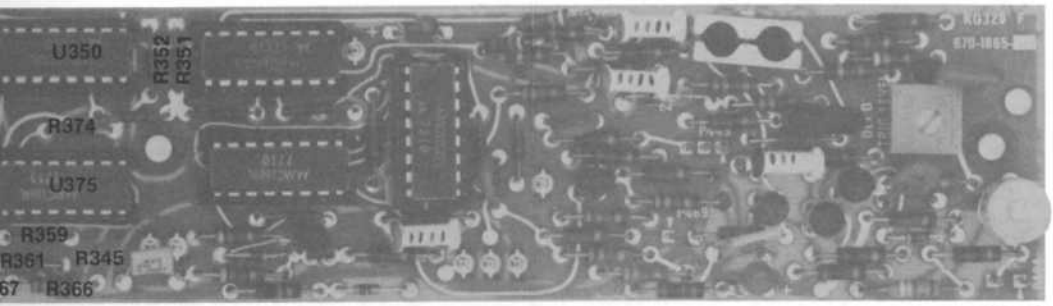


Fig. 8-8. Partial A4—Trigger circuit board component locator (SN B209999 and below).

P/O A4 (SNB209999 & BELOW)
Fig. 8-8



1342-56

Circuit board component locator (SN B209999 and below).

 **Static Sensitive Devices**
See Maintenance Section

P/O A4 ASSY

Main Trigger Generator
(SN B209999 & Below)

2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C301	A7	A2	R330	D7	A1
C310	B6	A1	R332	C6	A1
C313	B7	B2	R333	C6	A1
C317	B7	B2	R335	D6	B2
C319	B7	A2	R339	D4	B1
C324	C7	B1	R340	C4	B1
C330	C7	A1	R342	D4	C1
C340	C4	B1	R343	D5	C1
C344	C5	B1	R344	C5	B1
C347	D5	B1	R345	D5	C2
C359	G3	C2	R346	D6	B1
C363	D2	B2	R347	D5	B1
C377	E4	C2	R351	E5	D1
			R352	E4	D1
CR307	A6	A2	R357	F5	C2
CR308	A7	A2	R359	F3	C2
CR340	D4	B1	R361	E2	C2
CR343	D5	B1	R363	E2	B2
CR361	E2	C2	R364	F2	B2
CR365	F2	C2	R366	F2	C2
			R367	F2	C2
Q310	B7	A2	R374	F3	C1
Q311	B7	B2	R375	G3	C2
Q315	B7	B2	R376	E4	C2
Q320	C7	B1	R377	E4	C2
Q322	C7	B1	R379	E4	C2
Q366	F2	C2	R383	G3	B2
Q382	H3	C2	R384	H3	B2
			R386	H3	B2
			R387	H3	B2
R301	A7	A2	U350A	D4	C1
R303	A7	A2	U350B	D5	C1
R307	A6	A2	U350C	E5	C1
R310	B6	A2	U350D	E4	C1
R311	B7	B2	U355A	F2	C1
R312	B8	A1	U355B	E4	C1
R313	B8	A2	U355C	G4	C1
R315	B6	B2	U355D	F3	C1
R317	B7	A2	U375A	G3	C2
R320	C4	B1	U375B	H4	C2
R322	C4	B1			
R325	C7	B1			
R326	C7	A1			
R328	C7	A1	VR320	C4	B1

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base Unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-loading digital multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Extender	Required for extending the 7B53AN from the mainframe when making waveform and voltage measurements.	Tektronix extender plug-in. Tektronix Part Number 067-0589-00 or Tektronix flexible extender, Tektronix Part Number 067-0616-00, or equivalent.

Voltage Conditions

The 7B53AN Unit under test must be connected to a mainframe separate from the test oscilloscope. No signal is applied for voltage measurements. Voltmeter common is connected to chassis ground.

DELAY TIME MULT	5.00
MAG	X1
POSITION	Center display horizontally
DLY'D TRIG	
LEVEL	Control center
SLOPE	(+)
COUPLING	AC
SOURCE	INT

7B53AN Control Settings

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC
SOURCE	INT
SLOPE	(+)
LEVEL	Control center
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms (press in for DLY'D display mode)
VARIABLE	CAL (pull out for MIXED display mode)

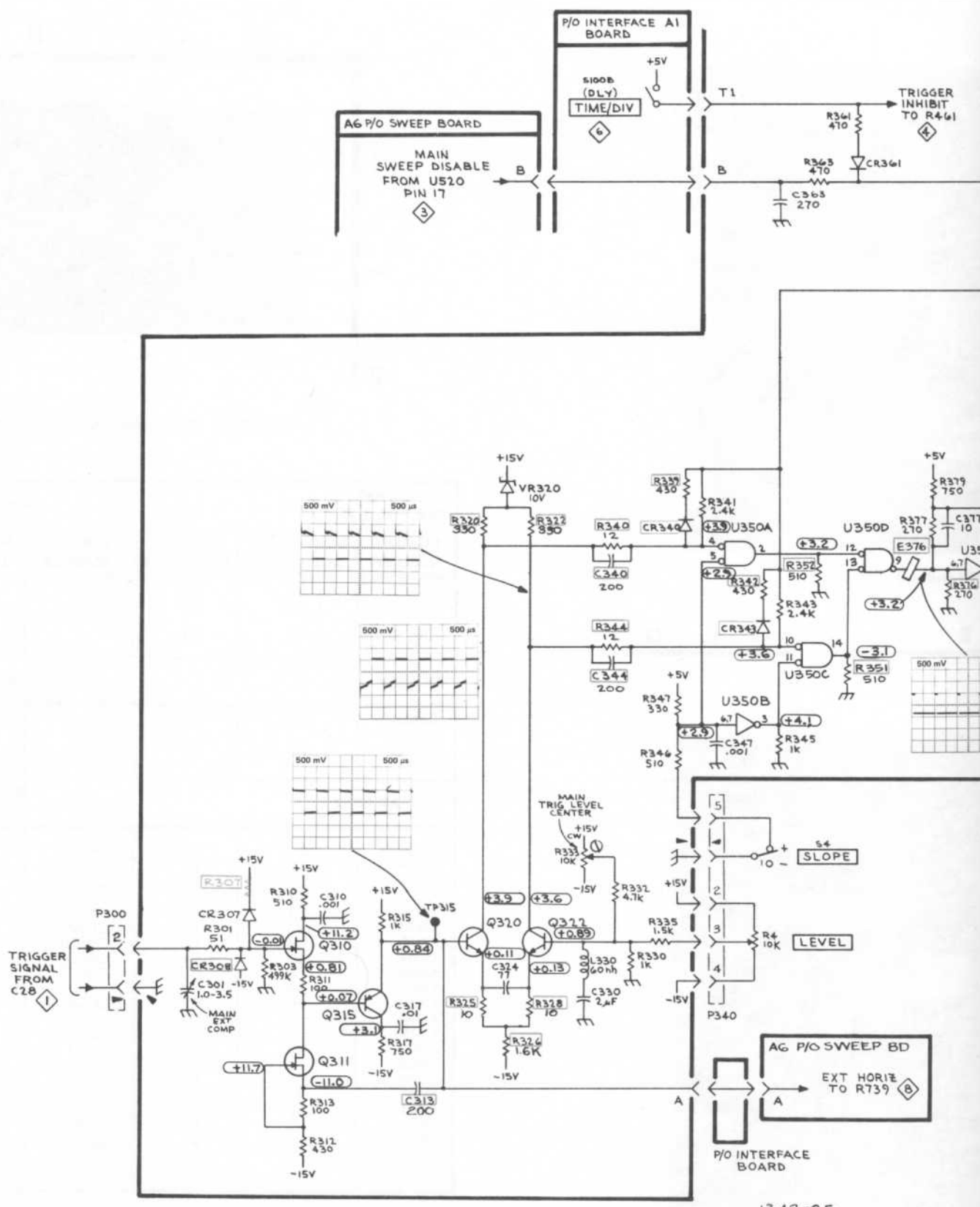
Waveform Conditions

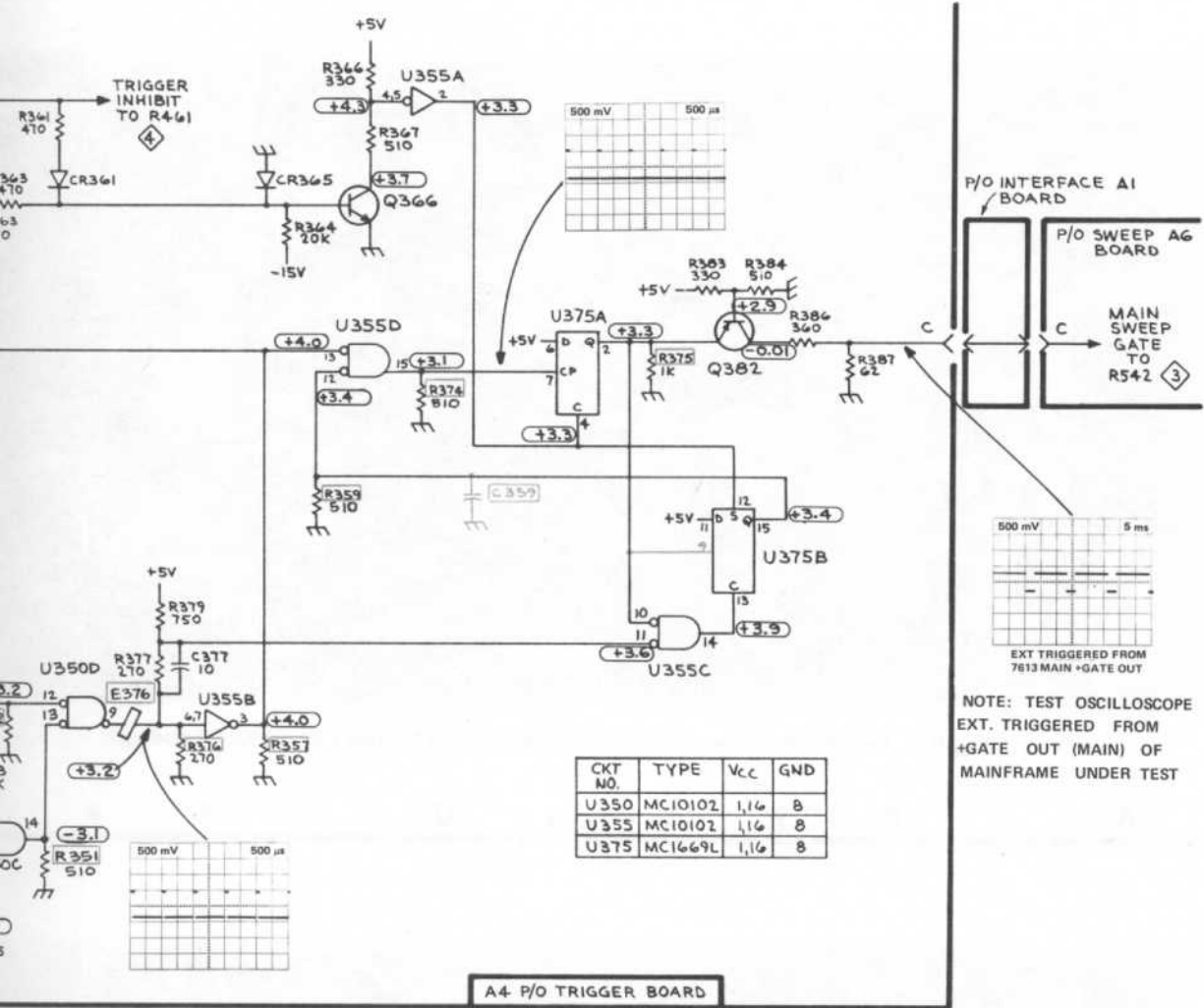
Front panel controls are set the same as for voltage measurements. The test oscilloscope 0.4 Volt calibration signal is applied to the vertical amplifier of the mainframe to which the 7B53AN is connected. The vertical amplifier of the system under test is set for 100 mV/Division. The test oscilloscope is triggered from the calibration signal; vertical input is AC coupled.

Tolerances of voltages and waveforms shown are ±20%.

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CKT NO.	TYPE	V _{CC}	GND
U350	MC10102	1,16	8
U355	MC10102	1,16	8
U375	MC1669L	1,16	8

NOTE: TEST OSCILLOSCOPE EXT. TRIGGERED FROM +GATE OUT (MAIN) OF MAINFRAME UNDER TEST

NOTE: P/O INDICATES PART OF SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

⊗ Static Sensitive Devices See Maintenance Section

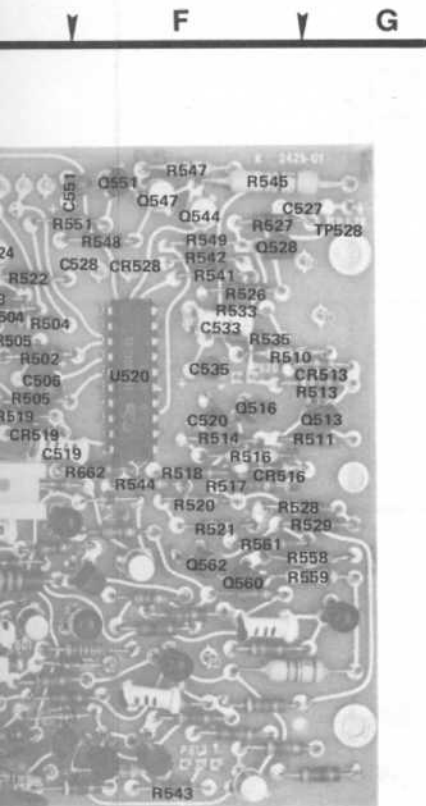
MAIN TRIGGER GENERATOR (SN B209999 & BELOW)

MAIN TRIGGER GENERATOR SN B209999 & BELOW

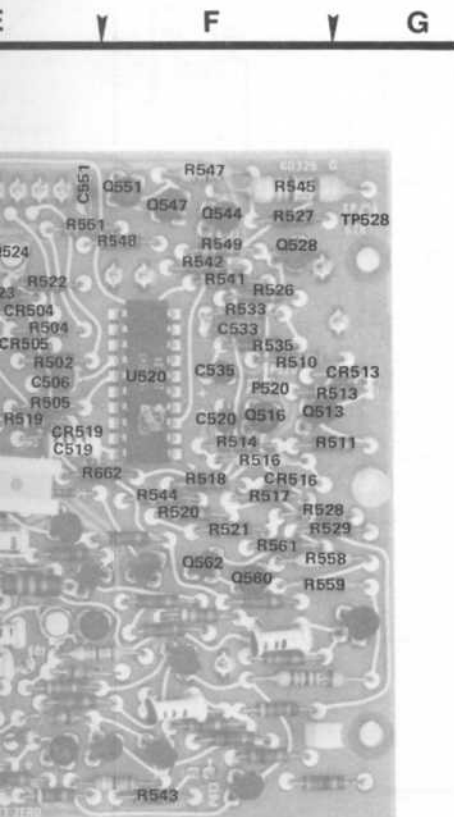


Static Sensitive Devices
See Maintenance Section

*See Parts List for serial number ranges.



1342-57



1342-58

C527 added to beck SN B030000

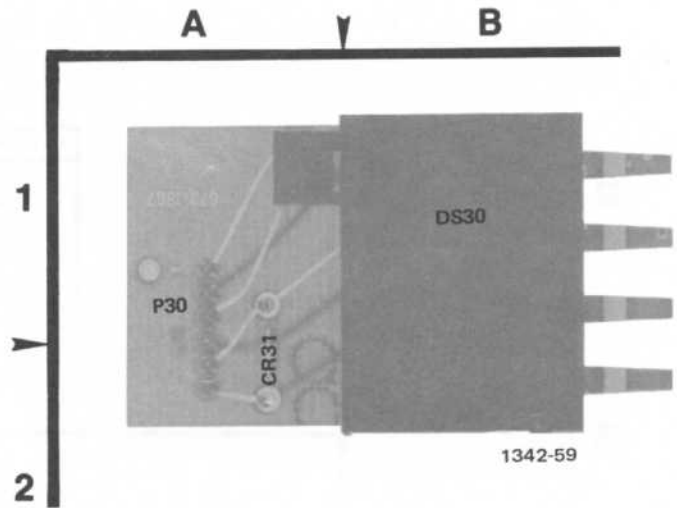


Fig. 8-11. A5-Mode Switch circuit board.

P/O A1 ASSY SEE FIG. 8-17			Main Sweep Generator 3		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C101 C103	E3 E3	G3 G3	R105 R205	E3 B3	F3 A3
CR220	B2	C1			
A5 ASSY			Main Sweep Generator 3		
CR031	A2	A1	P030	A3	A1
DS030	A3	B1			
P/O A6 ASSY			Main Sweep Generator (SN B090000 & Up) 3		
C506 C519 C520 C527 C528 C533 C535 C551 C555 C568 C572 C578 C579 C580 C582 C589 C590 C591 C594 C595	C3 B5 D1 E2 F2 D3 D4 E6 F6 D8 C2 G5 G4 F6 G7 G7 H6 H6 G6	E2 E2 F2 F1 F2 F2 F2 E1 D2 D1 C2 D2 E2 E2 D2 D2 E2 E2 D2 D2 E2 E1	CR504 CR505 CR513 CR516 CR519 CR528 CR556* CR566 CR582 LR580 P570 Q513 Q516 Q524 Q528 Q538 Q544	B3 C3 B5 B5 C5 F2 G7 C8 F6 G4 F5 B5 B5 B3 D2 C5 C7	E2 E2 F2 E2 F2 D2 D1 D2 E2 E2 C2 F2 F2 E1 F1 E1 F1

P/O A6 ASSY

Main Sweep Generator
(SN B090000 & up)

3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
Q547	D7	F1	R535	D4	F2	R579	G5	D2
Q551	D6	F1	R539	C5	E1	R581	H5	D2
Q560	D6	F3	R541	C5	F1	R582	F6	D2
Q562	D6	F3	R542	C7	F1	R583	H5	D2
Q564	C8	D2	R543	C6	F4	R584	H5	D2
Q568	D8	D1	R544	C6	F2	R589	G7	D2
Q584	H5	D3	R545	D7	F1	R590	G7	D2
Q596	H7	E2	R547	D6	F1	R591	G6	D2
			R548	D7	F1	R592	H6	C1
			R549	D5	F1	R597	G7	G1
R502	C2	E2	R551	E6	E1			
R504	C3	E2	R553	E7	D2	TP528	E2	D1
R505	C3	E2	R555*	F7	D2	TP551	E6	D2
R508	B2	C1	R556	F7	D2	TP580	J5	D1
R509	C2	C1	R558	C6	F3			
R510	B5	F2	R559	C6	F3	U520	D3	F2
R511	B5	F2	R561	D6	F3	U580	G5	D2
R513	B4	F2	R563	C8	D1			
R514	B5	F2	R564	D8	D1	VR570	F4	C2
R516	B5	F2	R565	D8	D1			
R517	B4	F2	R566	C8	D1	C528	F2	CHASSIS
R518	C5	F2	R567	D7	D1	CR528	F2	CHASSIS
R519	B5	E2	R568	D8	D2	DS8	G1	CHASSIS
R520	C4	F3	R569	E8	E1	R07	F1	CHASSIS
R521	C4	F3	R570	F4	B2	R09	E5	CHASSIS
R522	C3	E2	R571	F4	C2	S30	A2	CHASSIS
R523	C3	E2	R572	F4	C2	S100A	F3	CHASSIS
R526	D2	F2	R574	F5	C2			
R527	D2	F1	R575	F5	C2			
R528	E2	F2	R576	F5	D2			
R529	E3	F3	R578	F5	D2			
R533	D3	F2						

P/O A6 ASSY

Main Sweep Generator
(SN B089999 & Below)

3

C506	C3	E2	Q562	D6	F3	R561	D6	F3
C519	B5	E2	Q564	C8	D2	R563	C8	D1
C520	D1	F2	Q568	D8	D1	R564	D8	D1
C527	E2	F1	Q584	H5	D3	R565	D8	D1
C533	D3	F2	Q596	H7	E2	R566	C8	D1
C535	D4	F2				R567	D7	D1
C551	E6	E1	R502	C2	E2	R568	D8	D2
C555	F6	D2	R504	C3	E2	R569	E8	E1
C568	D8	D1	R505	C3	E2	R570	F4	B2
C572	F5	C2	R508	B2	C1	R571	F4	C2
C578	F5	D2	R509	C2	C1	R572	F4	C2
C579	G5	E2	R510	B5	F2	R574	F5	C2
C580	G4	E2	R511	B5	F2	R575	F5	C2
C582	F6	D2	R513	B4	F2	R576	F5	D2
C589	G7	D2	R514	B5	F2	R578	F5	D2
C590	G7	D2	R516	B5	F2	R579	G5	D2
C591	H6	D2	R517	B4	F2	R581	H5	D2
C594	H6	E2	R518	C5	F2	R582	F6	D2
C595	G6	E1	R519	B5	E2	R583	H5	D2
			R520	C4	F3	R584	H5	D2
CR504	B3	E2	R521	C4	F3	R589	G7	D2
CR505	C3	E2	R522	C3	E2	R590	G7	D2
CR513	B5	F2	R523	C3	E2	R591	G6	D2
CR516	B5	F2	R526	D2	F2	R592	H6	C1
CR519	C5	E2	R527	D2	F1	R597	G7	E2
CR566	C8	D1	R528	E2	F2			
CR582	F6	D2	R529	E3	F3	TP528	E2	G1
			R533	D3	F2	TP551	E6	D2
LR580	G4	E2	R535	D4	F2	TP580	J5	D1
			R539	C5	E1			
P570	F5	E2	R541	C5	F1	U520	D3	F2
			R542	C7	F1	U580	G5	D2
Q513	B5	F2	R543	C6	F4			
Q516	B5	F2	R544	C6	F2	VR570	F4	C2
Q524	B3	E1	R545	D7	F1			
Q528	D2	F1	R547	D6	F1	C528	F2	CHASSIS
Q538	C5	E1	R548	D7	F1	CR528	E2	CHASSIS
Q544	C7	F1	R549	D5	F1	DS8	G1	CHASSIS
Q547	D7	F1	R551	E6	E1	R07	F1	CHASSIS
Q551	D6	F1	R553	E7	D2	R09	E5	CHASSIS
Q560	D6	F3	R556	F7	D2	S30	A2	CHASSIS
			R558	C6	F3	S100A	F3	CHASSIS
			R559	C6	F3			

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base Unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-loading digital multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Extender	Required for extending the 7B53AN from the mainframe when making waveform and voltage measurements.	Tektronix extender plug-in. Tektronix Part Number 067-0589-00 or Tektronix flexible extender, Tektronix Part Number 067-0616-00, or equivalent.

Voltage Conditions

The 7B53AN Unit under test must be connected to a mainframe separate from the test oscilloscope. No signal is applied for voltage measurements. Voltmeter common is connected to chassis ground.

DELAY TIME MULT	5.00
MAG	X1
POSITION	Center display horizontally
DLY'D TRIG	
LEVEL	Control center
SLOPE	(+)
COUPLING	AC
SOURCE	INT

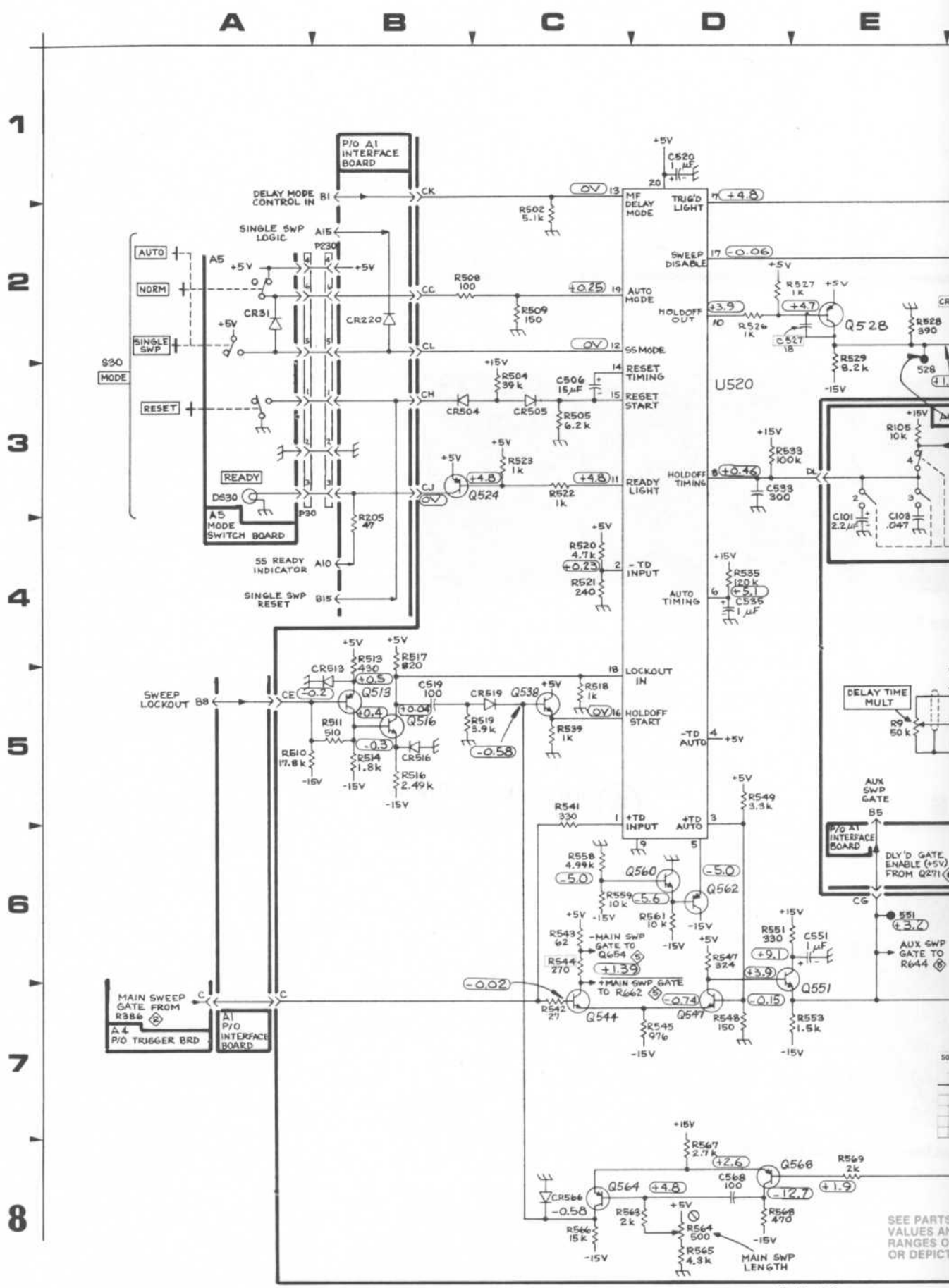
7B53AN Control Settings

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC
SOURCE	INT
SLOPE	(+)
LEVEL	Control center
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms (press in for DLY'D display mode)
VARIABLE	CAL (pull out for MIXED display mode)

Waveform Conditions

Front panel controls are set the same as for voltage measurements. The test oscilloscope 0.4 Volt calibration signal is applied to the vertical amplifier of the mainframe to which the 7B53AN is connected. The vertical amplifier of the system under test is set for 100 mV/Division. The test oscilloscope is triggered from the +GATE OUT (MAIN) of the mainframe under test; vertical input is AC coupled.

Tolerances of voltages and waveforms shown are ±20%.

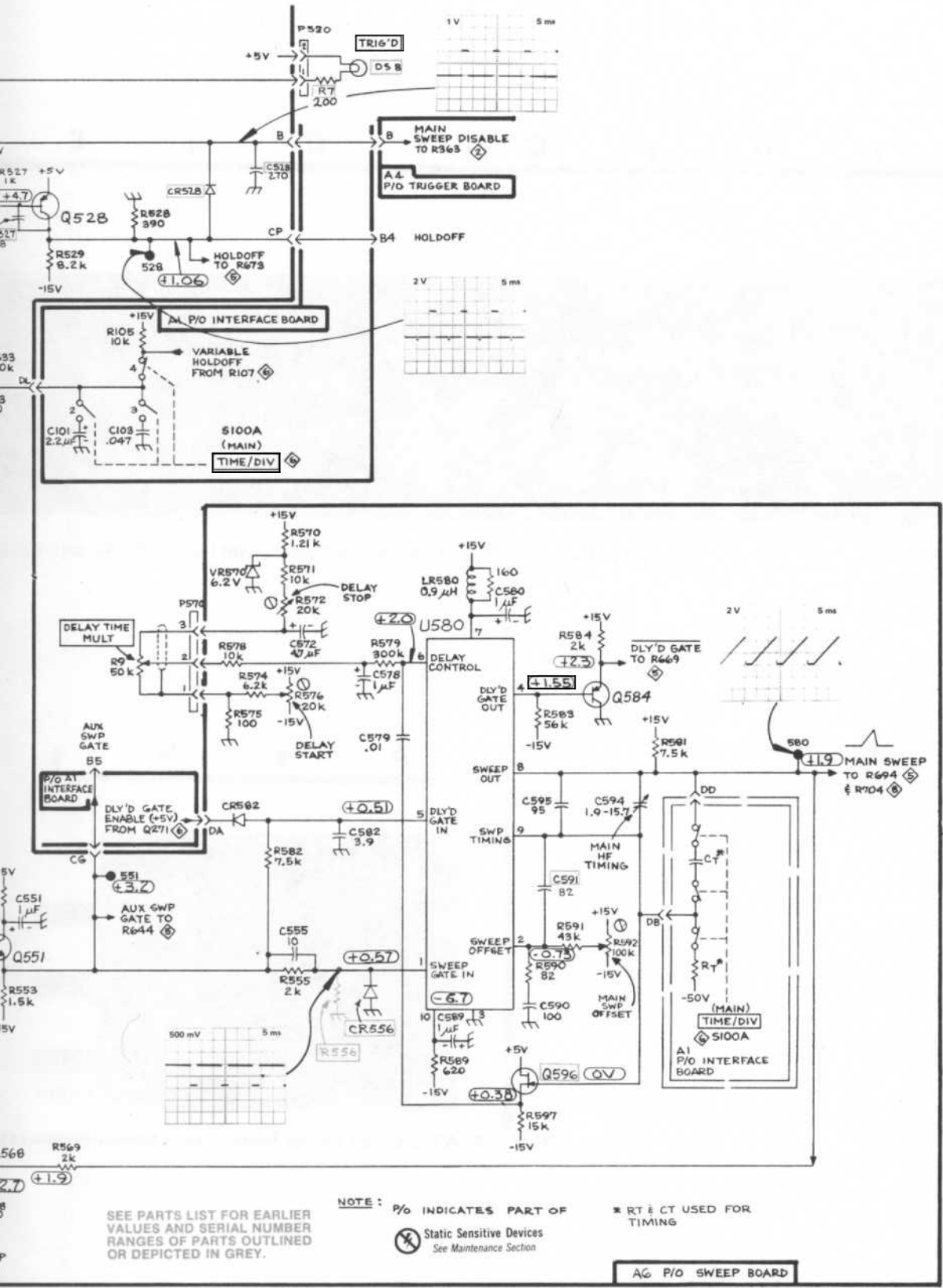


7B53A/7B53AN

1342-29
REV APR 1986

SEE PARTS
VALUES AND
RANGES OF
OR DEPICTED

E F G H J



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

NOTE: % INDICATES PART OF
 * RT & CT USED FOR TIMING
 Static Sensitive Devices
 See Maintenance Section

AG P/O SWEEP BOARD

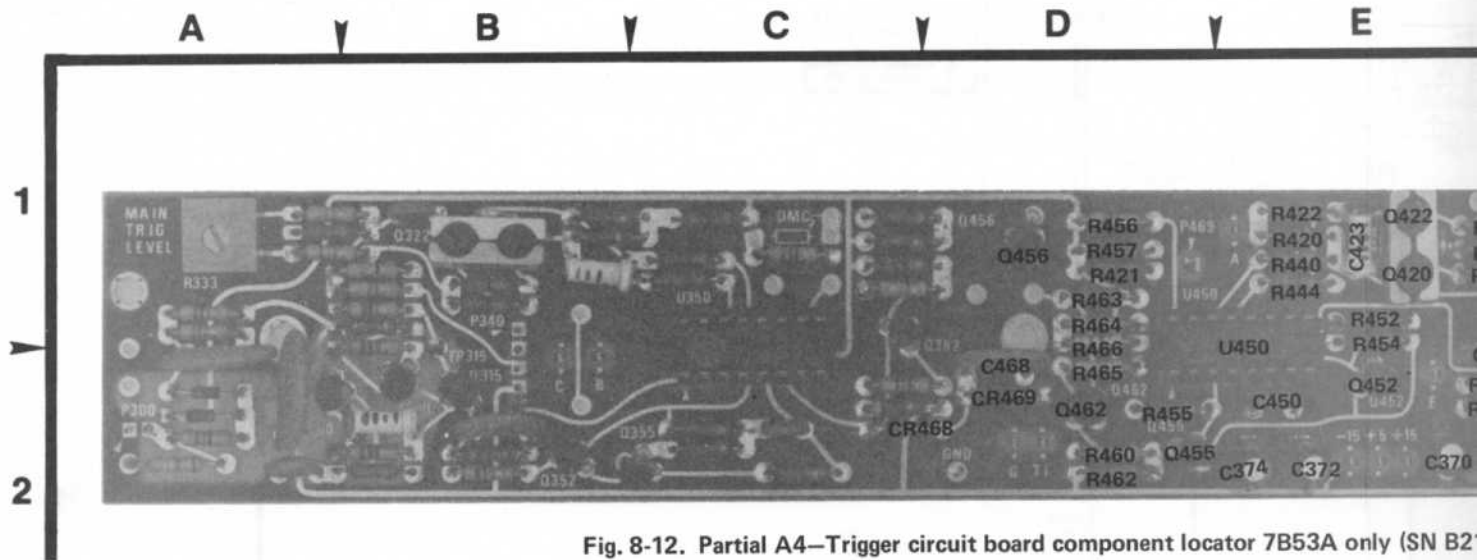


Fig. 8-12. Partial A4-Trigger circuit board component locator 7B53A only (SN B210000 & UP)

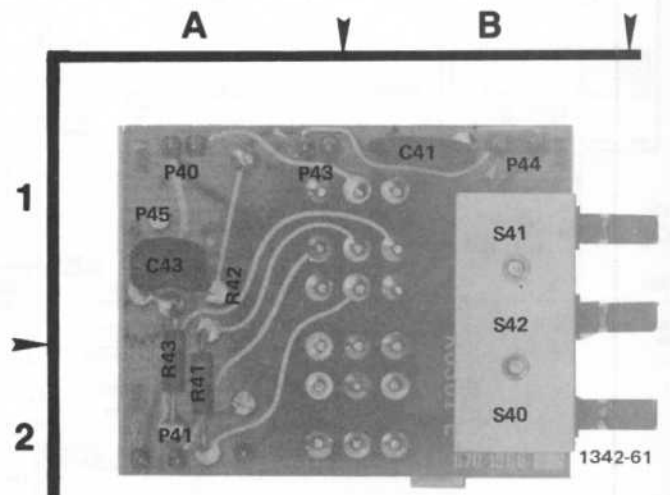
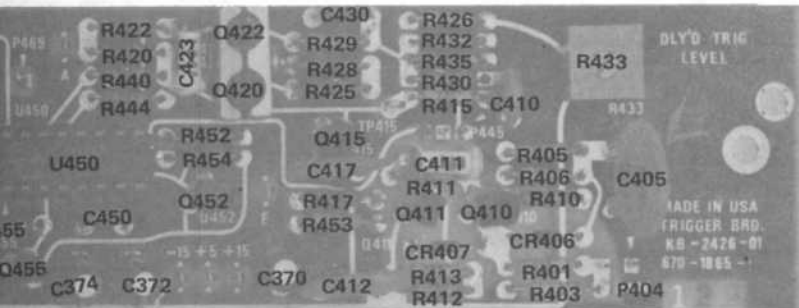


Fig. 8-13. A7-Delayed Trigger Switch circuit board component locator

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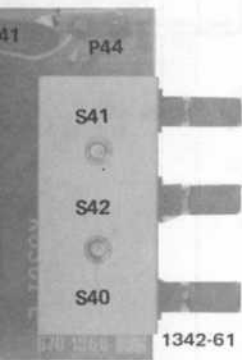
1342-60

t locator 7B53A only (SN B210000 and up).

B



Static Sensitive Devices
See Maintenance Section



1342-61

circuit board component locator.

P/O A4 ASSY			Delayed Trigger Generator (SN B210000 & UP)		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C405	D8	G2	R412	E7	F2
C410	E6	F1	R413	E7	F1
C411	E6	F2	R415	F6	F1
C412	F8	E2	R417	F7	E2
C417	F7	F2	R420	H5	E1
C423	H5	E1	R421	H5	D1
C430	K7	E1	R422	H5	E1
C450	K1	E2	R425	H7	E1
C468	F4	D2	R426	H7	F1
			R428	H7	F1
CR406	D7	F2	R429	J6	F1
CR407	D6	F2	R430	L7	F1
CR468	F4	C2	R432	L6	F1
CR469	F3	D2	R433	L6	F1
			R435	M6	F1
P404	D6	C2	R440	H4	E1
			R444	J4	E1
Q410	E6	F2	R452	L3	E1
Q411	E7	F2	R453	M3	E2
Q415	F6	F1	R454	M2	E1
Q420	H6	E1	R455	N3	D2
Q422	J6	E1	R456	F1	D1
Q452	L2	E2	R457	E1	D1
Q455	N2	D2	R460	D3	D2
Q456	F1	D1	R462	E3	D2
Q462	E3	D2	R463	E2	D1
			R464	E3	D1
R401	D6	F2	R465	D3	D2
R403	D6	F2	R466	E3	D2
R405	D8	F1			
R406	E8	F2	TP415	F6	F1
R410	E6	F2			
R411	E6	F2	U450	K2	E2

A7 ASSY			Delayed Trigger Generator		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C41	C6	B2	P40	B4	A1
C43	C5	A1	P43	B5	A2
			P45	N4	A1
R41	C6	A2	P41	B5	A2
R42	C5	A1			
R43	C5	A2	S40	N4	B2
			S41	C4	B1
			S42	B4	B1
			R5	N6	CHASSIS

A | B | C | D | E | F | H

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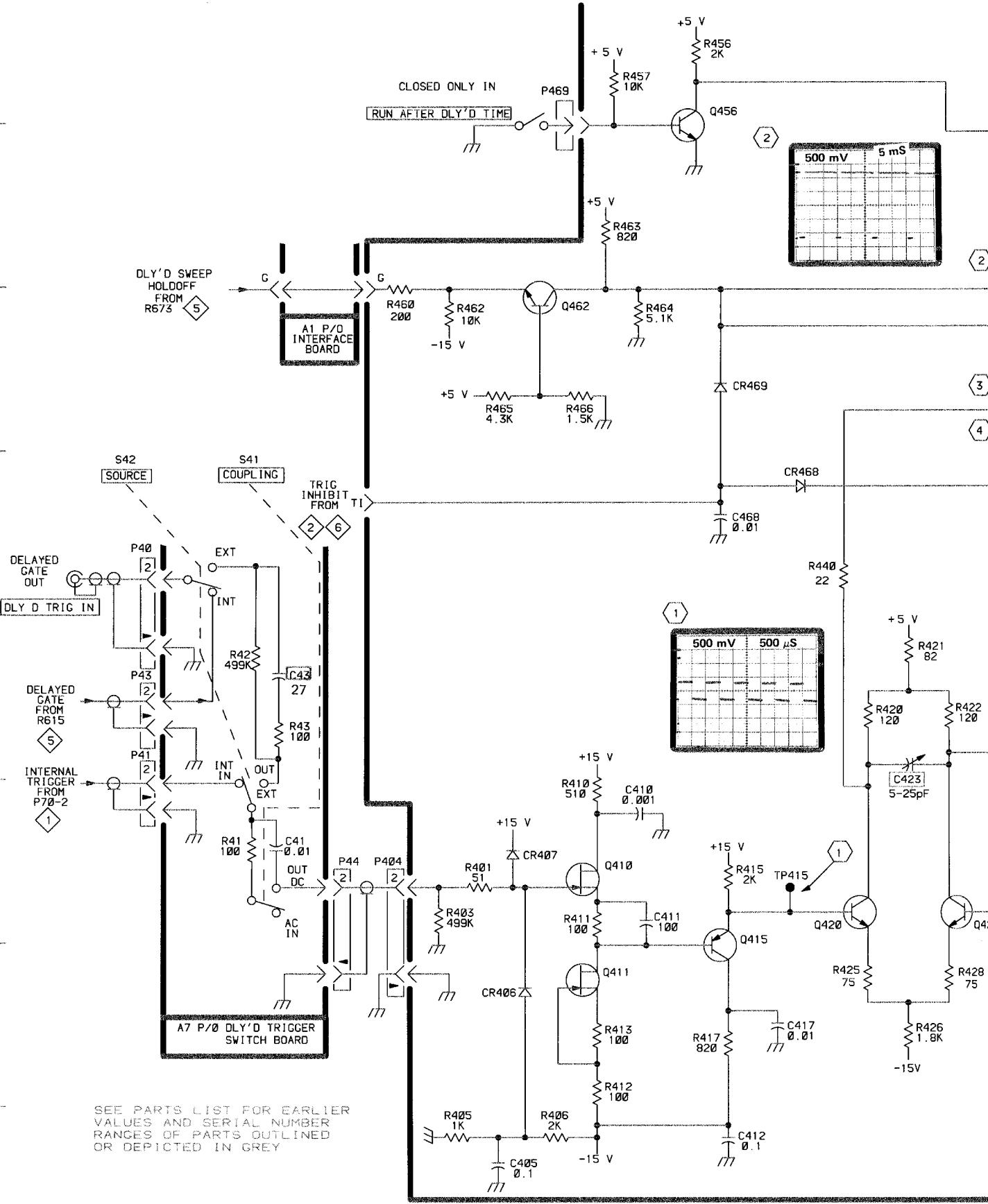
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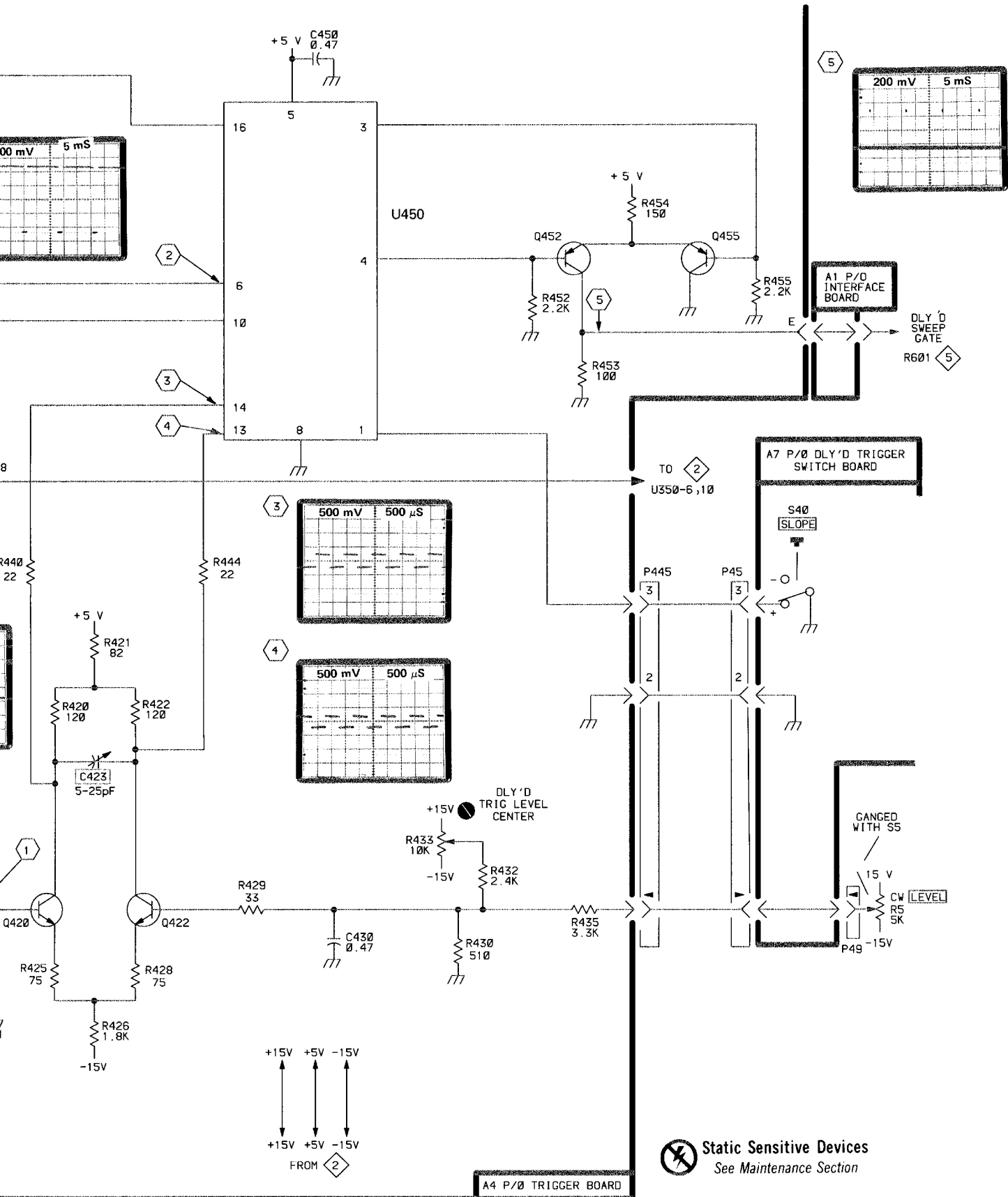
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SEE PARTS LIST FOR EARLIER
VALUES AND SERIAL NUMBER
RANGES OF PARTS OUTLINED
OR DEPICTED IN GREY



DELAYED TRIGGER GENERATOR
SN B210000 & UP

DELAYED TRIGGER GENERATOR
(SN B210000 & UP)

Static Sensitive Devices
See Maintenance Section

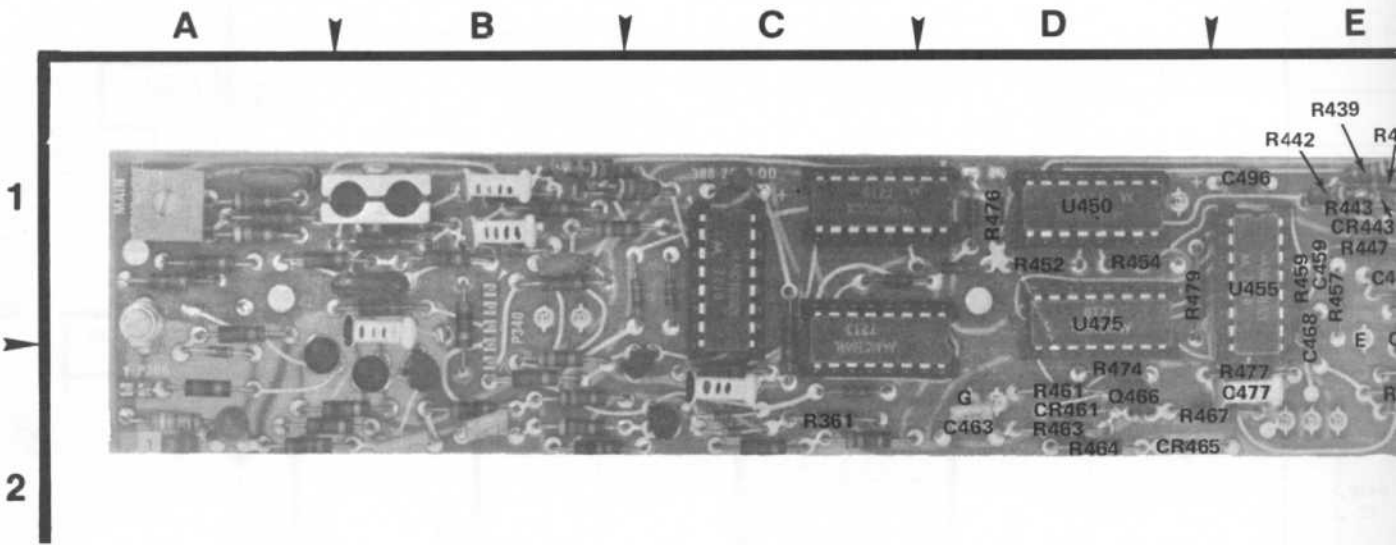
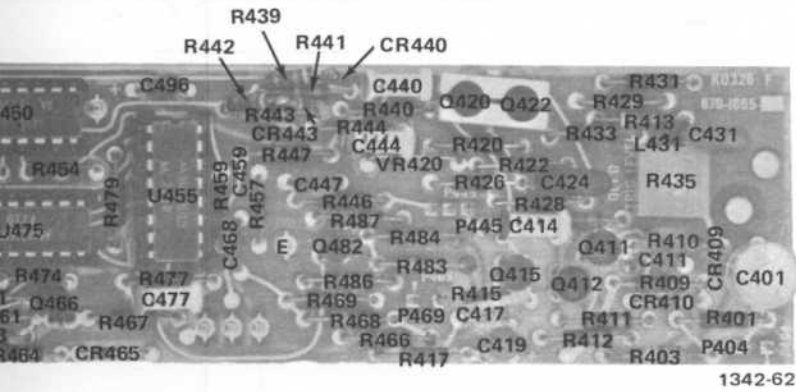


Fig. 8-14. Partial A4—Trigger circuit board component locator (SN B209999 and below)

E F G



locator (SN B209999 and below).

 **Static Sensitive Devices**
See Maintenance Section

P/O A4 ASSY			Delayed Trigger Generator (SN B209999 & Below)		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C401	C7	G2	R439	E4	E1
C411	C7	F2	R440	E4	E1
C414	D8	F2	R441	E4	E1
C417	D7	F2	R442	F5	E1
C424	E7	F1	R443	F5	E1
C431	E5	F1	R444	E5	E1
C440	E5	E1	R445**	F6	E2
C444	E5	E1	R446	E6	E1
C447	F6	E1	R447	E5	E1
C459*	G4	E1	R452	F5	D1
C463	E2	D2	R454	F5	D1
C468	F3	E2	R457	G5	E1
C477	G4	E2	R459	G4	E1
C496		E1	R461	F2	D2
			R463	E2	D2
CR409	C6	G2	R464	F2	D2
CR410	C7	F2	R466	G2	E2
CR440	E4	E1	R467	G2	D2
CR443	F5	E1	R468	G3	E2
CR461	F2	D2	R469	F3	E2
CR465	F2	D2	R474	G3	D2
P404	C7	G2	R475**	H3	E2
Q411	C7	F2	R476	G5	D1
Q412	C7	F2	R477	G5	E2
Q415	D7	F2	R479	G4	D1
Q420	D7	F1	R483	H3	E2
Q422	E7	F1	R484	H3	E2
Q466	G2	D2	R486	H3	E2
Q482	H3	E2	R487	H3	E2
R401	C7	G2	U450A	F5	D1
R403	C7	F2	U450B	F4	D1
R409	C6	F2	U450C	F6	D1
R410	C6	F2	U450D	F5	D1
R411	C7	F2	U455A	G3	E1
R412	C7	F2	U455B	H4	E1
R413	C8	F1	U455C	G2	E1
R415	D6	F2	U455D	G3	E1
R417	D7	E2	U475A	H4	D2
R420	D4	F1			
R422	E4	F1	U475B	H3	D2
R426	D7	F1			
R428	E7	F1	VR420	D4	E1
R429	E7	F1			
R431	E7	F1			
R433	E6	F1	R5	G7	CHASSIS
R435	E6	F1	S5	D3	CHASSIS
R437	E7	F2			

** LOCATED ON BACK OF BOARD

*See Parts List for serial number ranges.

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 M Ω , 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base Unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-loading digital multimeter)	Input impedance 10 M Ω Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Extender	Required for extending the 7B53AN from the mainframe when making waveform and voltage measurements.	Tektronix extender plug-in. Tektronix Part Number 067-0589-00 or Tektronix flexible extender, Tektronix Part Number 067-0616-00, or equivalent.

Voltage Conditions

The 7B53AN Unit under test must be connected to a mainframe separate from the test oscilloscope. No signal is applied for voltage measurements. Voltmeter common is connected to chassis ground.

DELAY TIME MULT	5.00
MAG	X1
POSITION	Center display horizontally
DLY'D TRIG	
LEVEL	Control center
SLOPE	(+)
COUPLING	AC
SOURCE	INT

7B53AN Control Settings

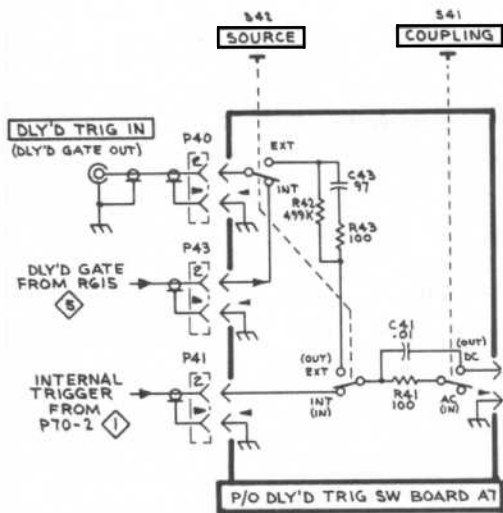
MAIN TRIGGERING

MODE	AUTO
COUPLING	AC
SOURCE	INT
SLOPE	(+)
LEVEL	Control center
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms (press in for DLY'D display mode)
VARIABLE	CAL (pull out for MIXED display mode)

Waveform Conditions

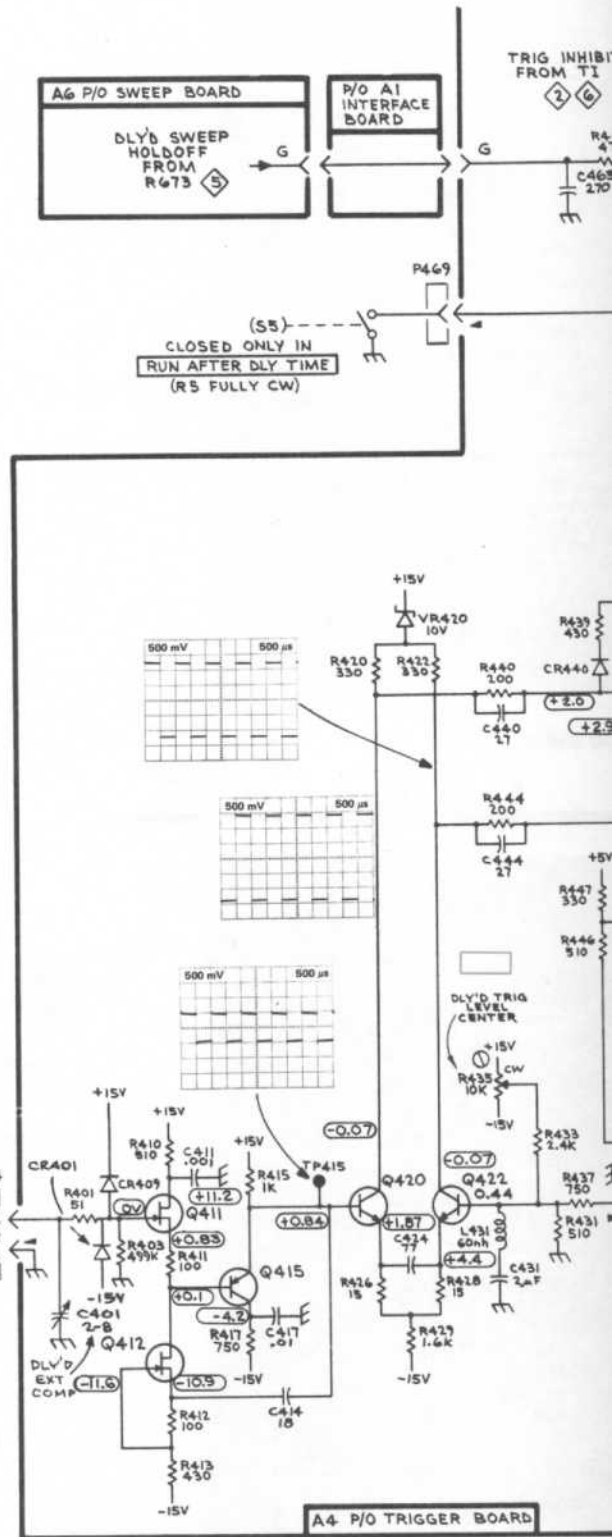
Front panel controls are set the same as for voltage measurements. The test oscilloscope 0.4 Volt calibration signal is applied to the vertical amplifier of the mainframe to which the 7B53AN is connected. The vertical amplifier of the system under test is set for 100 mV/Division. The test oscilloscope is triggered from the + GATE OUT (MAIN) of the mainframe under test; vertical input is AC coupled.

Tolerances of voltages and waveforms shown are $\pm 20\%$.



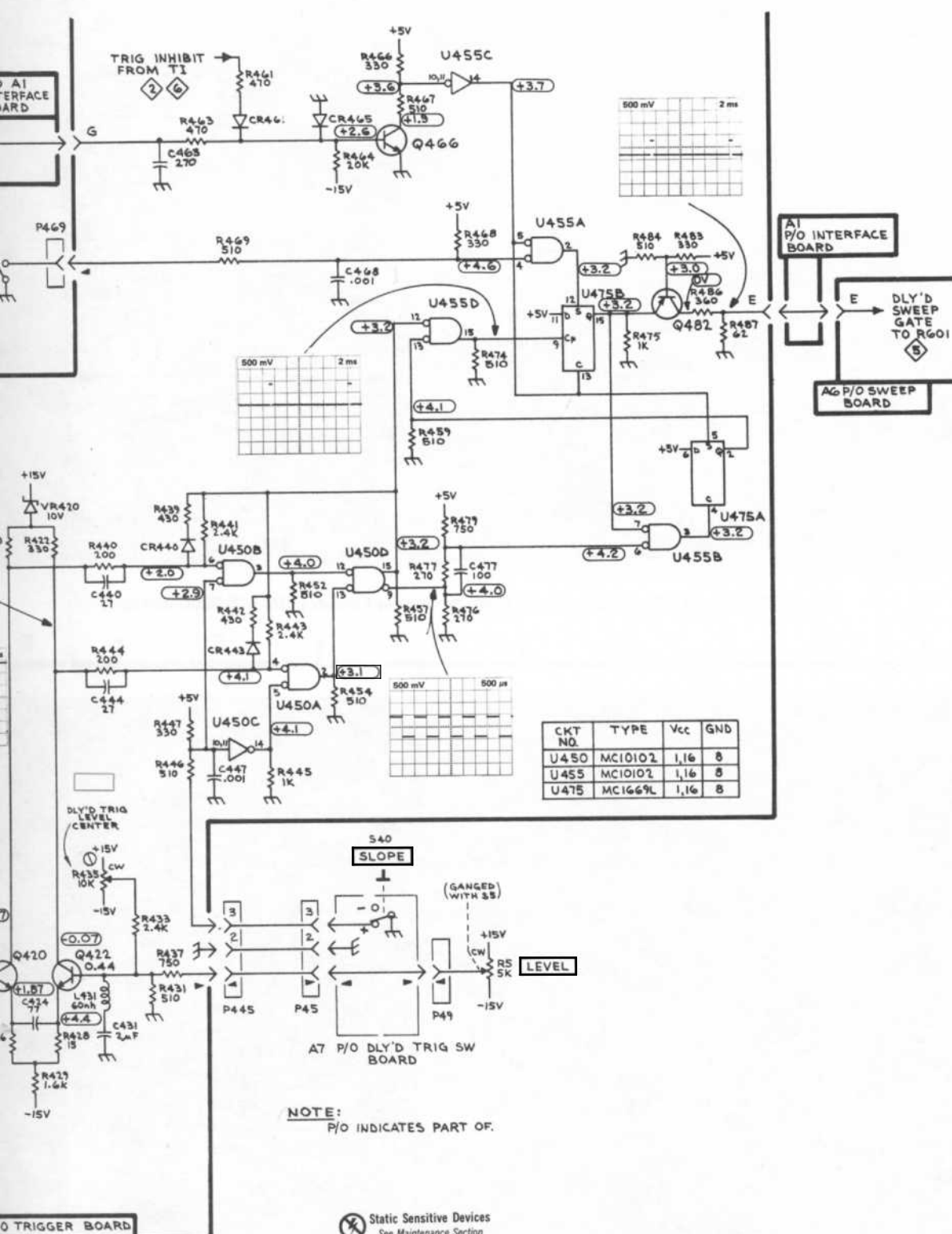
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY

7B53A/7B53AN



1342-32

REV E APR 1980

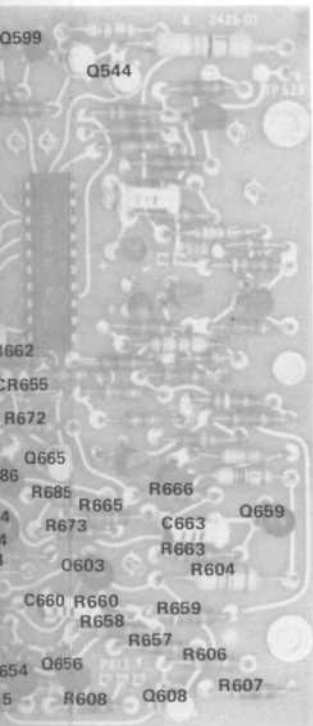


NOTE:
P/O INDICATES PART OF.

⊗ Static Sensitive Devices
See Maintenance Section

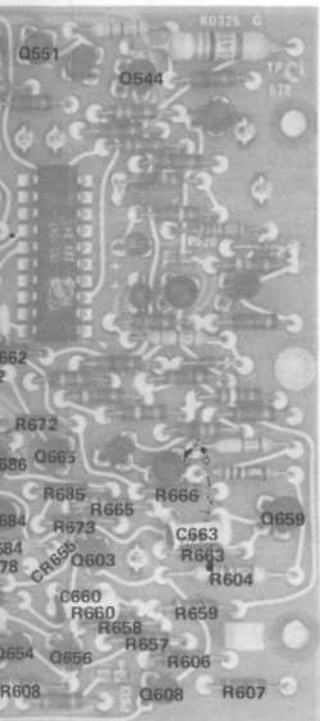
1342-32
APR 1980
DELAYED TRIGGER GENERATOR 4 mgf
(SN B209999 & BELOW) 1172

F G



1342-63A

F G



1342-64



Static Sensitive Devices
See Maintenance Section

*See Parts List for serial number ranges.

**Located on back of board

P/O A6 ASSY

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C610	C5	E3
C611	C6	E3
C615	D3	E4
C618	C7	D3
C616	C3	D3
C637	F3	C3
C638	G3	C4
C639	H3	D3
C643	G3	D2
C644	F2	C2
C647	H2	C4
C650	D5	D3
C652	C5	D3
C660	D4	F3
C663	E4	F3
C677	D6	E3
C678	D6	E3
C679	C6	E3
C680	A8	D2
C683	B7	E3
C689	D7	E3
C690	D6	D4
C691	E6	D4
CR617	C2	D3
CR624	A2	C3
CR629	B2	C3
CR635	C2	C3
CR641	H2	C3
CR648	H3	C3
CR654*	B4	E3
CR655	C7	F2
CR661	D5	E3
CR662	E5	E2
CR677	C7	E3
CR678	B7	E3
CR686	C7	E3

P/O A6 ASSY

C610	C5	E3
C611	C6	E3
C615	D3	E4
C616	C3	D3
C618 *	C7	D3
C637	F3	C3
C638	G3	C4
C639	H3	D3
C643	G3	D2
C644	F2	C2
C647	H2	C4
C650	D5	D3
C652	C5	D3
C660	D4	F3
C663	E4	F3
C677	D6	E3
C678	D6	E3
C679	C6	E3
C680	A3	D2
C683	B7	E3
C689	D7	E3
C690	D6	D4
C691	E6	D4
CR617	C2	D3
CR624	A2	C3
CR629	B2	C3
CR635	C2	C3
CR641	H2	C3
CR648	H3	C3
CR654 *	B4	E3
CR655 *	C7	F2
CR661	D5	E3
CR662	E5	F2
CR677	C7	E3
CR678	B7	E3
CR686	C7	E3

Delayed Sweep Generator
(SN B090000 & Up)

5

BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
E3	CR695	G6	A4	R614	D3	E4	R665	E4	F3
E3	CR697	H6	A4	R615	D3	E4	R666	F4	F3
E4				R616	C3	D3	R668	F4	D2
D3	LR650	D4	D3	R617	C3	C3	R669	F4	D2
D3				R618	C7	D3	R670	F3	E2
C3	Q603	B6	F3	R619	C2	D3	R672	F4	F2
C4	Q608	B6	F4	R621	D3	C3	R673	F4	F3
D3	Q610	C5	E3	R622	D2	C3	R675	E6	D4
D2	Q620	D2	C3	R624	A2	C3	R676	D6	E3
C2	Q628	B2	C3	R626	B2	C3	R677	D7	E3
C4	Q633	C2	C3	R627	B2	C3	R679	C7	D3
D3	Q639	G3	D3	R628	B2	C3	R680	A7	D2
D3	Q642	G3	D2	R629	B2	C3	R681	A8	D2
F3	Q647	G3	C4	R631	B2	C3	R682	B7	E2
F3	Q654	C5	E3	R634	C2	C3	R683	B7	E2
E3	Q656	B4	F3	R635	C2	D3	R684	B5	E3
E3	Q659	D5	G3	R637	F3	D3	R685	B7	F3
E3	Q665	E5	F3	R638	G3	C3	R686	C8	E3
D2	Q671	F4	E2	R639	H3	C4	R687	C7	E3
E3	Q678	C7	E3	R641	G2	D3	R689	D7	E3
E3	Q682	B8	E2	R642	G2	C3	R690	E6	D3
D4	Q684	B7	E3	R644	F3	C2	R691	G6	D4
D4	Q688	C7	E3	R645	G3	C3	R692	G6	B3
	Q695	G6	B3	R647	H2	B4	R693	G6	B3
D3	Q696	H6	A3	R648	H2	B3	R694	F8	B3
C3	Q698	H7	A3	R649	H3	B3	R695	G5	B4
C3				R651	C6	D3	R696	G7	B3
C3	R601	A6	E3	R652	C5	D3	R697	H6	A4
C3	R603	B6	E3	R653	C5	D3	R698	H6	A3
C3	R604	B6	F3	R655	C6	E3			
E3	R606	B6	F3	R657	C4	F3	TP601	A6	E3
F2	R607	B6	F4	R658	C4	F3	TP620	D2	D3
E3	R609**	C6	E3	R659	D4	F3	TP647	H2	C3
E2	R610	C5	E4	R660	D4	F3	TP690	F5	E3
E3	R611	C6	E3	R661	D5	E3	TP698	J6	B3
E3	R612	C6	E3	R662	E5	F2	U650	D5	E3
E3	R613	C6	D3	R663	E4	F3	W654*	B4	E3

Delayed Sweep Generator
(SN B089999 & Below)

5

BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
E3	CR695	G6	A4	R614	D3	E4	R665	E4	F3
E3	CR697	H6	A4	R615	D3	E4	R666	F4	F3
E4				R616	C3	D3	R668	F4	D2
D3	LR650	D4	D3	R617	C3	C3	R669	F4	D2
D3				R618*	C7	D3	R670	F3	E2
C3	Q603	B6	F3	R619	C2	D3	R672	F4	F2
C4	Q608	B6	F4	R621	D3	C3	R673	F4	F3
D3	Q610	C5	E3	R622	D2	C3	R675	E6	D4
D2	Q620	D2	C3	R624	A2	C3	R676	D6	E3
C2	Q628	B2	C3	R626	B2	C3	R677	D7	E3
C4	Q633	C2	C3	R627	B2	C3	R679	C7	D3
D3	Q639	G3	D3	R628	B2	C3	R680	A7	D2
D3	Q642	G3	D2	R629	B2	C3	R681	A8	D2
F3	Q647	H2	C4	R631	B2	C3	R682	B7	E2
F3	Q654	C5	E3	R634	C2	C3	R683	B7	E2
E3	Q656	B4	F3	R635	C2	D3	R684	B5	E3
E3	Q659	D5	G3	R637	F3	D3	R685	B7	F3
E3	Q665	E5	F3	R638	G3	C3	R686	C8	E3
D2	Q671	F4	E2	R639	H3	C4	R687	C7	E3
E3	Q678	C7	E3	R641	G2	D3	R689	D7	E3
E3	Q682	B8	E2	R642	G2	C3	R690	E6	D3
D4	Q684	B7	E3	R644	F3	C2	R691	G6	D4
D4	Q688	C7	E3	R645	G3	C3	R692	G6	B3
	Q695	G6	B3	R647	H2	B4	R693	G6	B3
D3	Q696	H6	A3	R648	H2	B3	R694	F8	B3
C3	Q698	H7	A3	R649	H3	B3	R695	G5	B4
C3				R651	C6	D3	R696	G7	B3
C3	R601	A6	E3	R652	C5	D3	R697	H6	A4
C3	R603	B6	E3	R653	C5	D3	R698	H6	A3
C3	R604	B6	F3	R655	C6	E3			
E3	R606	B6	F3	R657	C4	F3	TP601	A5	E3
2	R607	B6	F4	R658	C4	F3	TP620	D2	C3
E3	R609**	C6	E3	R659	D4	F3	TP647	H2	C3
E2	R610	C5	E4	R660	D4	F3	TP690	F5	E3
E3	R611	C6	E3	R661	D5	E3	TP698	J6	B3
E3	R612	C6	E3	R662	E5	F2			
E3	R613	C6	D3	R663	E4	F3	U650	D5	E3

VOLTAGES AND WAVEFORMS

The voltages and waveforms shown on this diagram were obtained by using the recommended test equipment and test set-ups listed below.

RECOMMENDED TEST EQUIPMENT

ITEM	SPECIFICATIONS	RECOMMENDED TYPE
Oscilloscope	Frequency response DC to 65 MHz Deflection factor 5 mV to 5 V/Div Input impedance 10 MΩ, 20 pF Sweep rate 500 ns	Tektronix 7603 or 7613 equipped with 7A15A Amplifier and 7B50 Time-Base Unit, or equivalent.
Probe	Fast rise 10X attenuation probe compatible with the vertical amplifier of the test oscilloscope.	Tektronix P6053A, or equivalent.
Voltmeter (Non-loading digital multimeter)	Input impedance 10 MΩ Range 0 – 500 V	Tektronix 7D13 Digital Multimeter (test oscilloscope must have readout system) or Fairchild Model 7050, or equivalent.
Extender	Required for extending the 7B53AN from the mainframe when making waveform and voltage measurements.	Tektronix extender plug-in. Tektronix Part Number 067-0589-00 or Tektronix flexible extender, Tektronix Part Number 067-0616-00, or equivalent.

Voltage Conditions

The 7B53AN Unit under test must be connected to a mainframe separate from the test oscilloscope. No signal is applied for voltage measurements. Voltmeter common is connected to chassis ground.

DELAY TIME MULT	5.00
MAG	X1
POSITION	Center display horizontally
DLY'D TRIG	
LEVEL	Control center
SLOPE	(+)
COUPLING	AC
SOURCE	INT

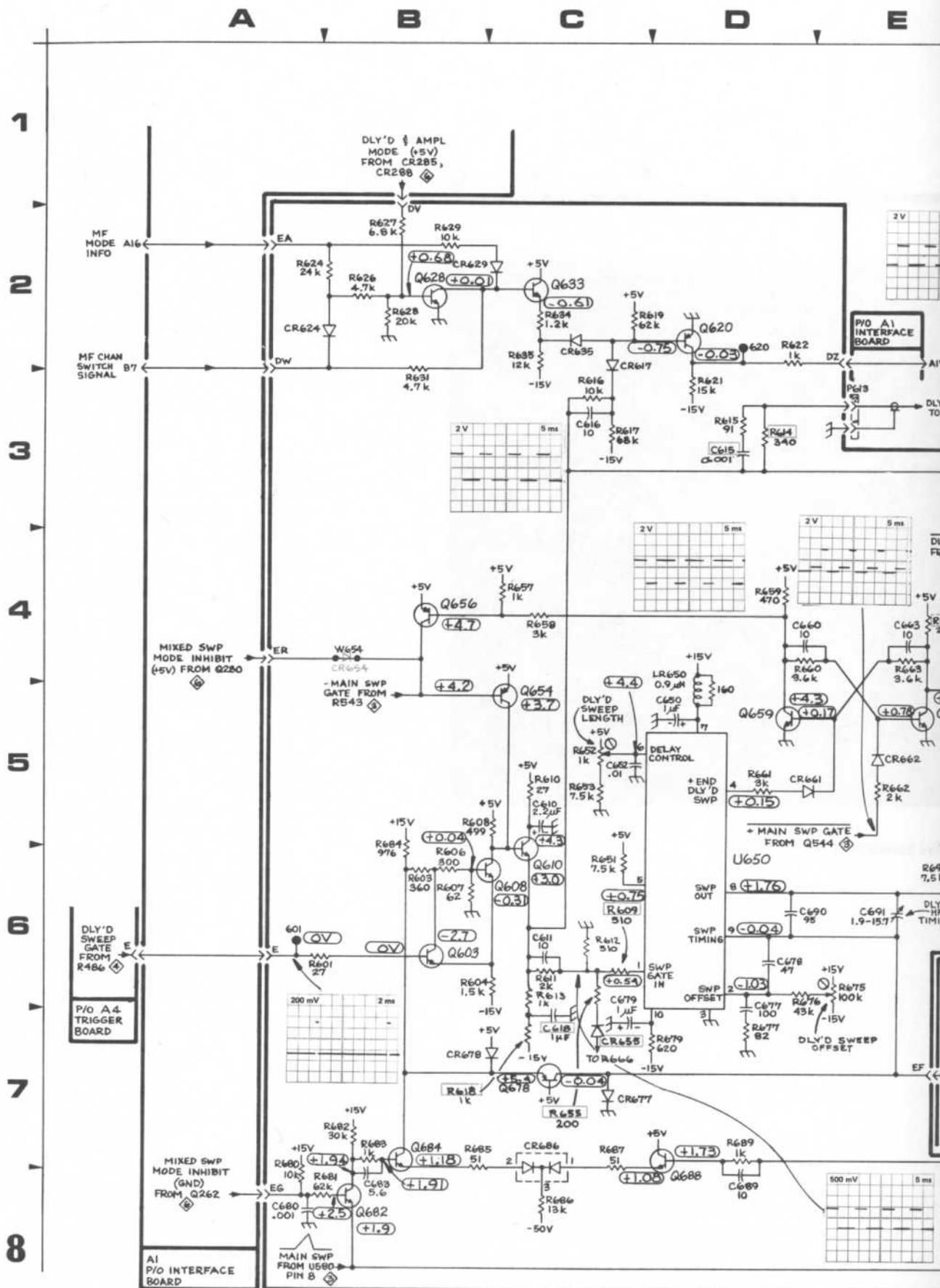
7B53AN Control Settings

MAIN TRIGGERING	
MODE	AUTO
COUPLING	AC
SOURCE	INT
SLOPE	(+)
LEVEL	Control center
TIME/DIV OR DLY TIME	1 ms
DLY'D Time/Division	0.5 ms (press in for DLY'D display mode)
VARIABLE	CAL (pull out for MIXED display mode)

Waveform Conditions

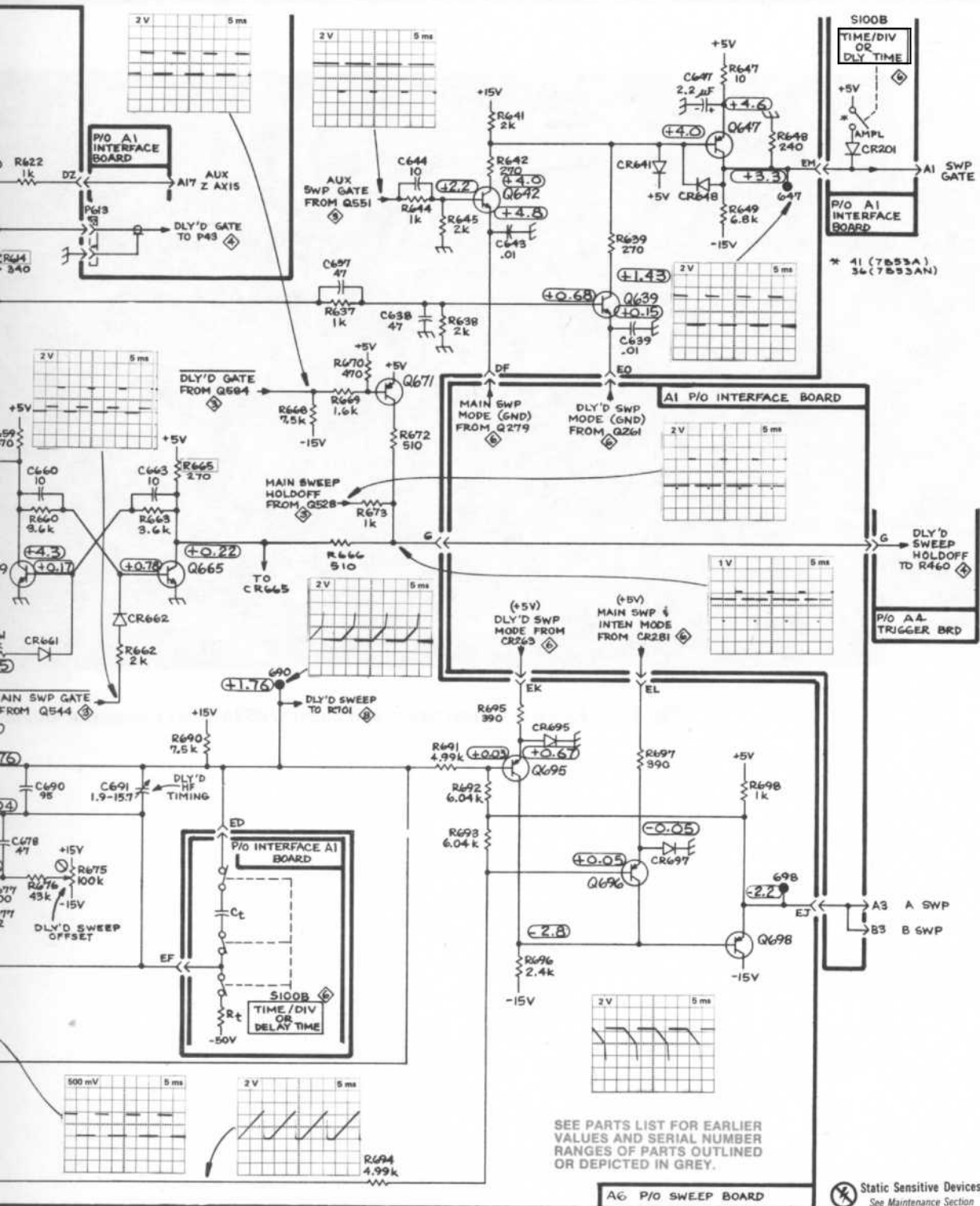
Front panel controls are set the same as for voltage measurements. The test oscilloscope 0.4 Volt calibration signal is applied to the vertical amplifier of the mainframe to which the 7B53AN is connected. The vertical amplifier of the system under test is set for 100 mV/Division. The test oscilloscope is triggered from the +GATE OUT (MAIN) of the mainframe under test; vertical input is AC coupled.

Tolerances of voltages and waveforms shown are ±20%.



7B53A/7B53AN

NOTE: P/O INDICATES PART OF 1342-35
REV SEP 1985



1342-35
REV SEP 1985

DELAYED SWEEP GENERATOR

Static Sensitive Devices
See Maintenance Section

5 K1F 673

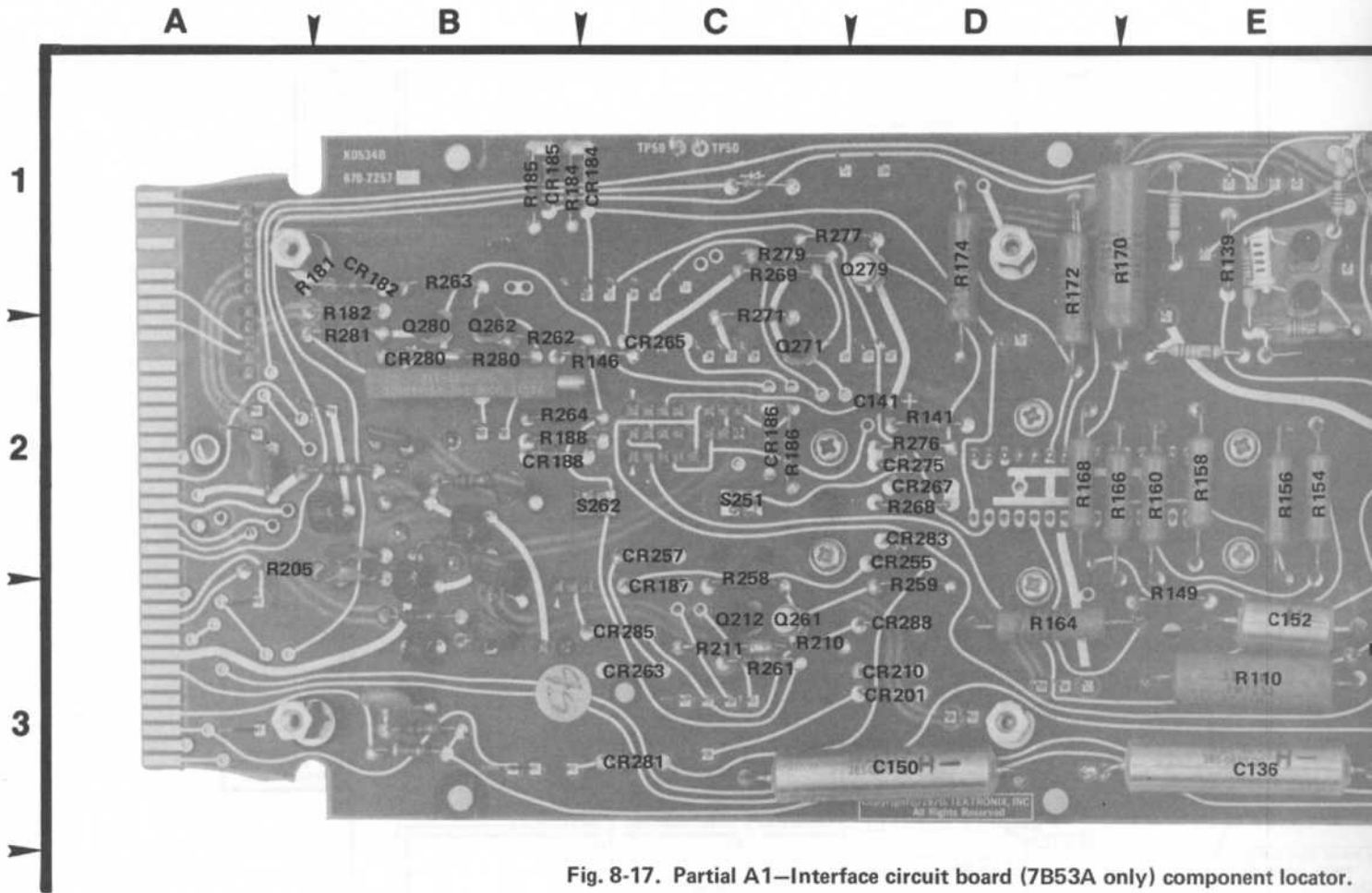
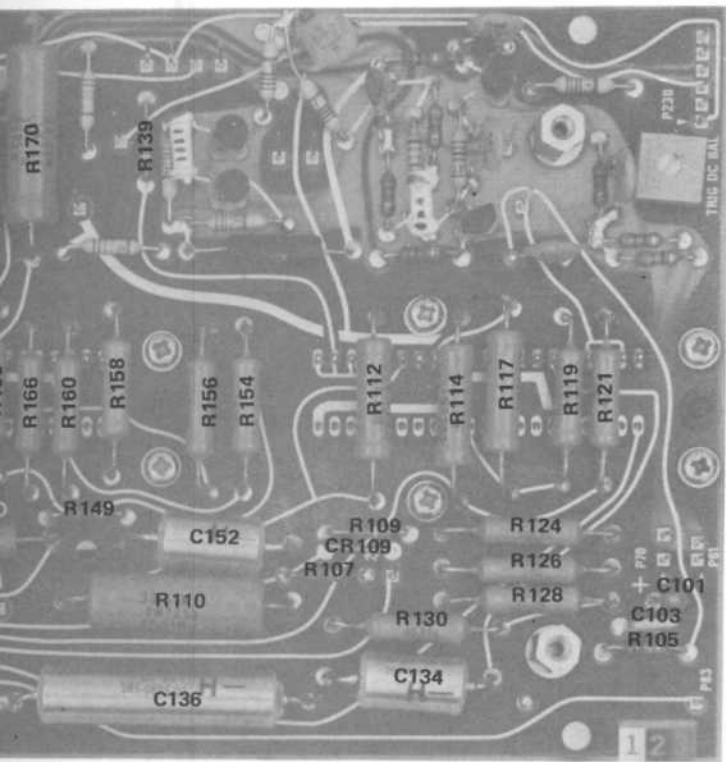


Fig. 8-17. Partial A1-Interface circuit board (7B53A only) component locator.

7B53A/7B53AN
Fig. 8-17

Y E Y F Y G



1342-65A

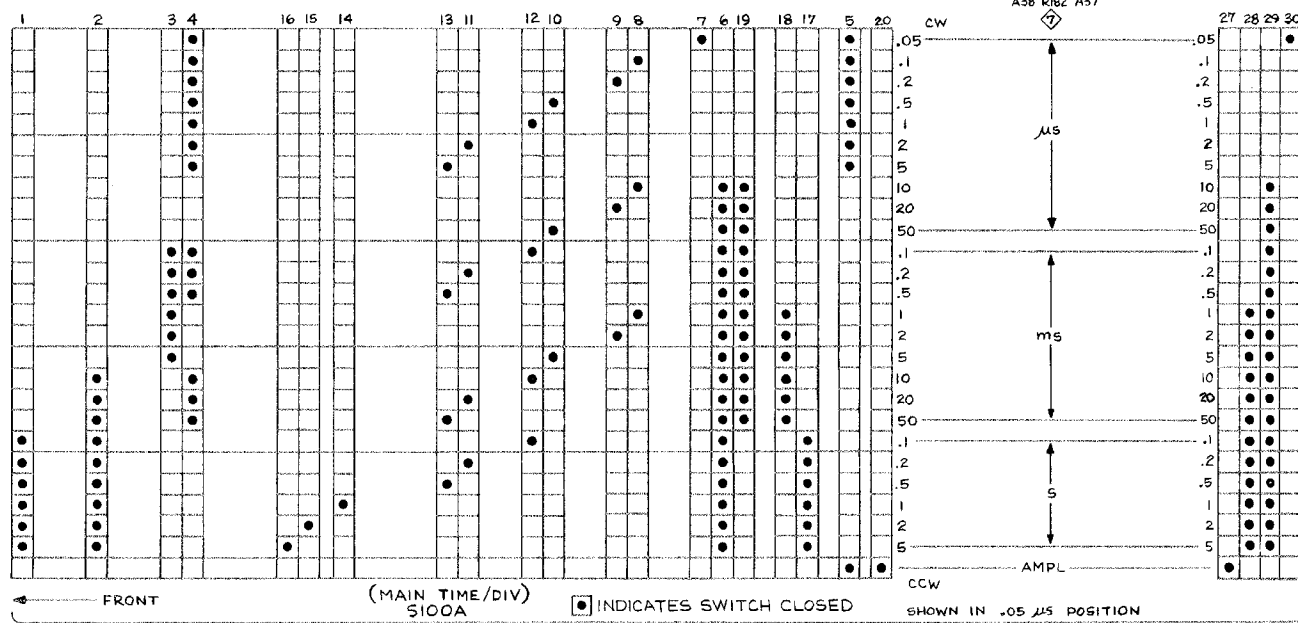
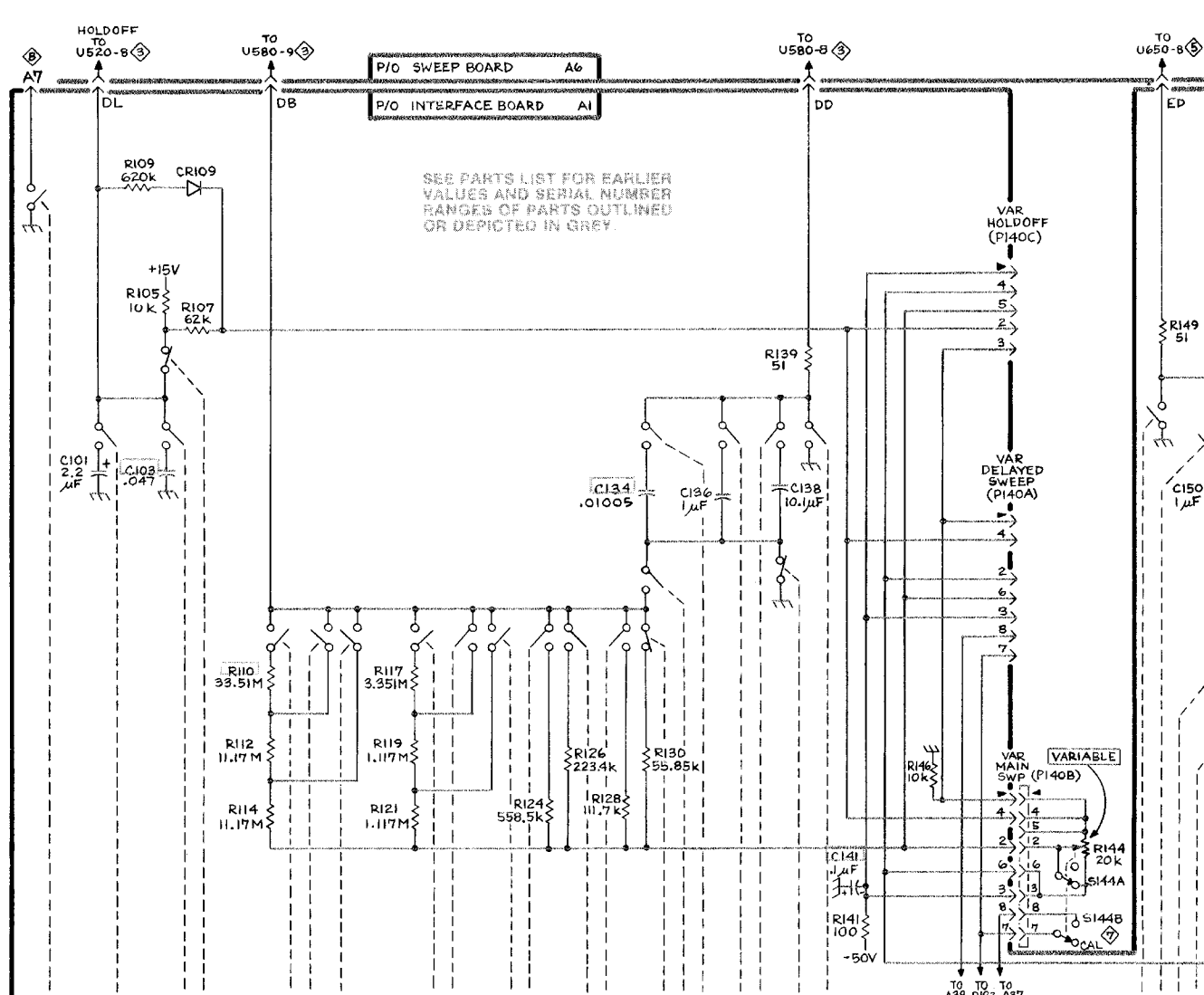
A only) component locator.

P/O A1 ASSY			Timing Switches 7B53A		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C101	A3	G3	R124	B5	F3
C103	A3	G3	R126	B5	G3
C134	C3	F3	R128	C5	F3
C136	C3	E3	R130	C5	F3
C138*	C3	F3	R139	D3	E1
C141	D5	D2	R141	D5	D2
C150	E3	D3	R146	D5	C2
C152	F3	E3	R149	E3	E3
			R154	E5	E2
CR109	A2	F3	R156	F5	E2
CR201	J4	D3	R158	F5	E2
CR210	F4	D3	R160	F5	E2
CR255	G2	D2	R164	G5	D3
CR257	G2	C2	R166	G5	D2
CR263	J3	C3	R168	G5	D2
CR265	J3	C2	R170	H5	D1
CR267	G3	D2	R172	H5	D1
CR280	H2	B2	R174	H5	D1
CR281	J1	C3	R205	A3	A2
CR283	J1	D2	R210	F4	C3
CR285	F3	C3	R211	F4	C3
CR288	F3	D3	R258	G2	C3
			R259	H3	D3
P140B	E5		R261	H2	C3
			R262	H2	B2
Q212	G4	C3	R263	J2	B1
Q261	H2	C3	R264	H2	B2
Q262	J2	B2	R268	H3	D2
Q271	H3	C2	R269	H3	C1
Q279	H2	D1	R271	H3	C2
Q280	J2	B2	R276	G2	D2
			R277	H2	C1
R105	A2	G3	R279	H2	C1
R107	A3	F3	R280	H2	B2
R109	A2	F3	R281	H2	B2
R110	A4	E3			
R112	A5	F2	S251	F1	C2
R114	A5	F2	S262A	H2	C2
R117	B4	F2			
R119	B5	F2	S144A	E5	CHASSIS
R121	B5	F2	S144B	E5	CHASSIS

*See Parts List for
serial number ranges.

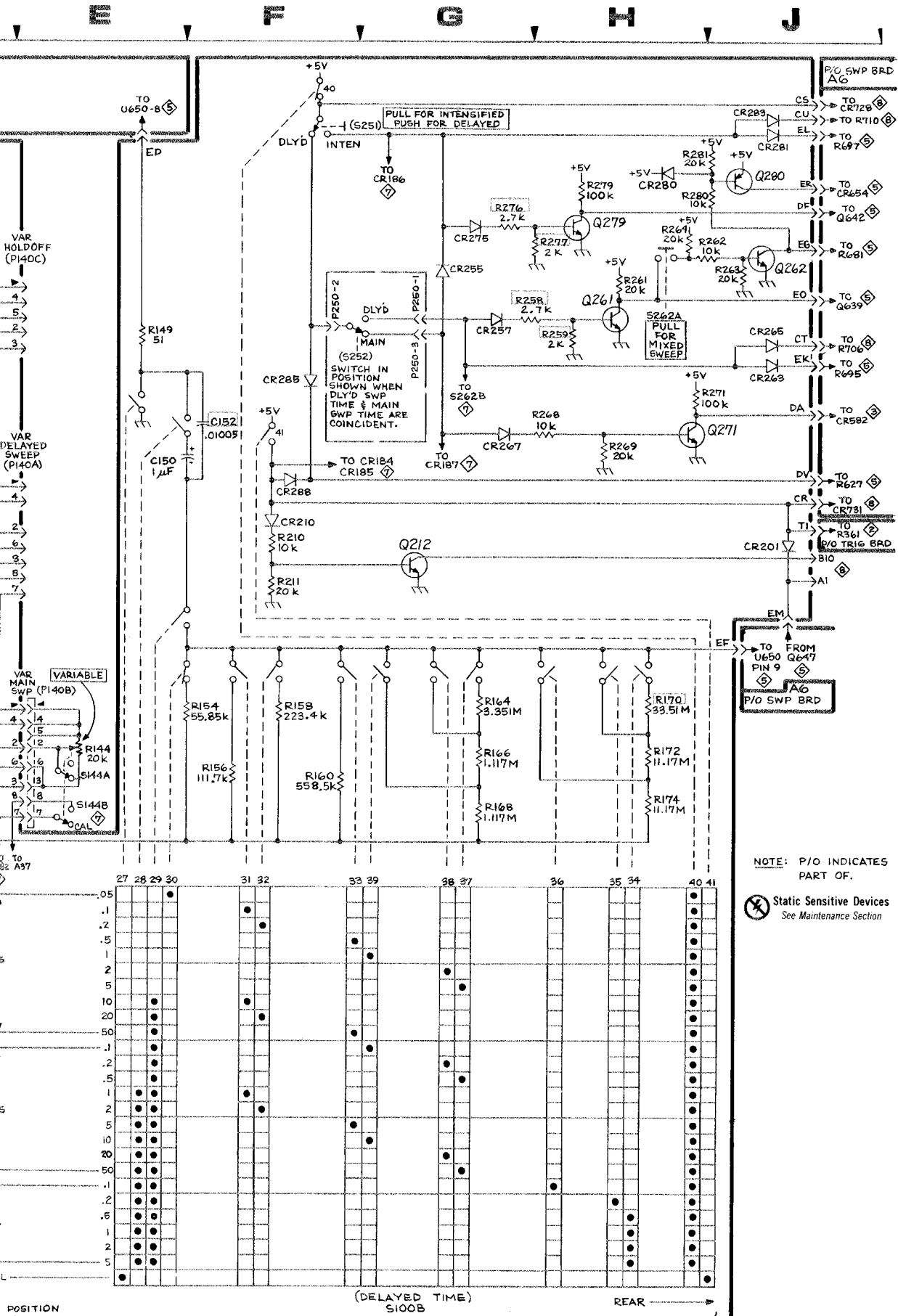
 **Static Sensitive Devices**
See Maintenance Section

1
2
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8



7B53A

REV MAY 1982



NOTE: P/O INDICATES PART OF.

Static Sensitive Devices
See Maintenance Section

POSITION TIME

REV MAY 1982

1342-37

TIMING SWITCHES

klf
373

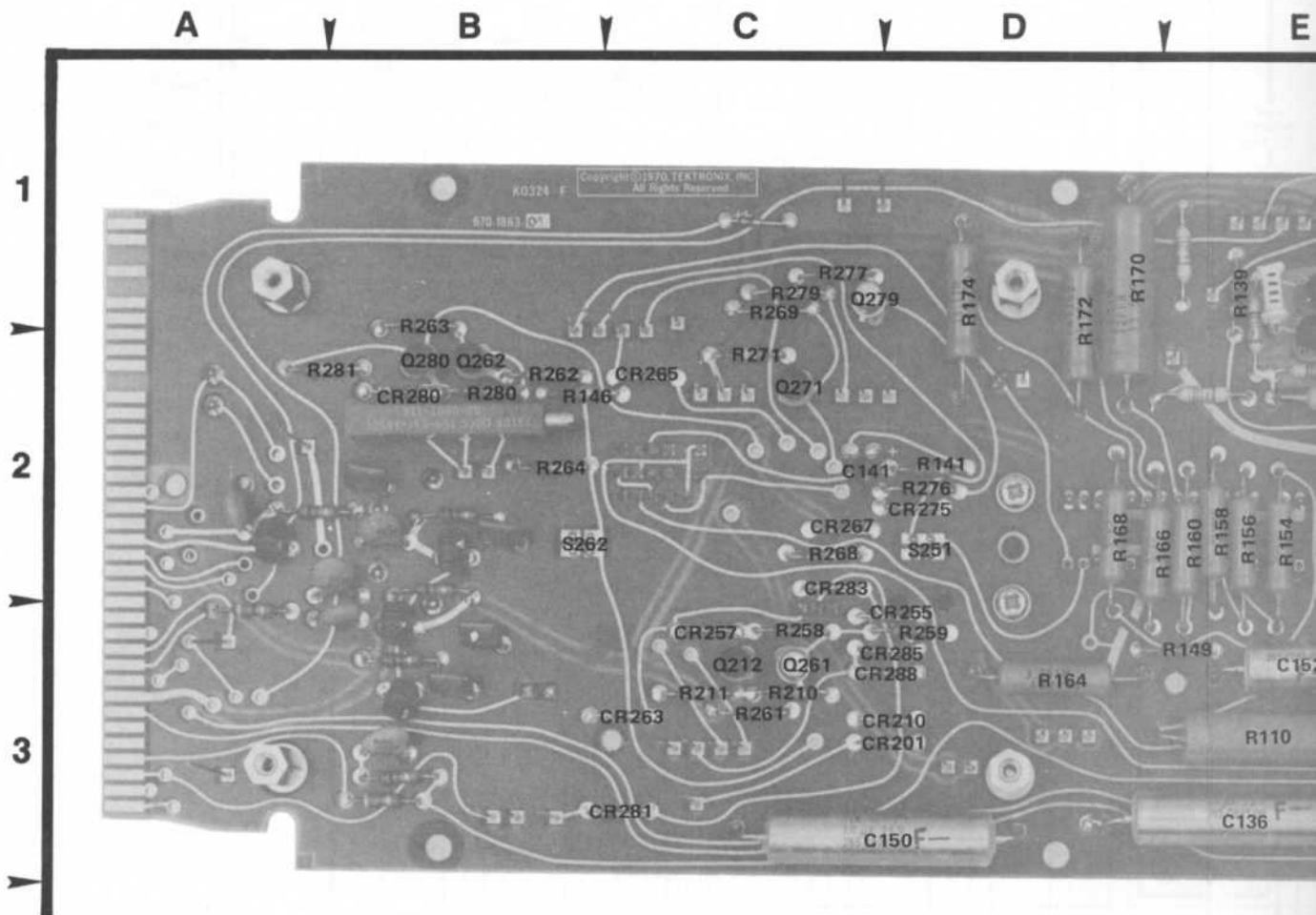
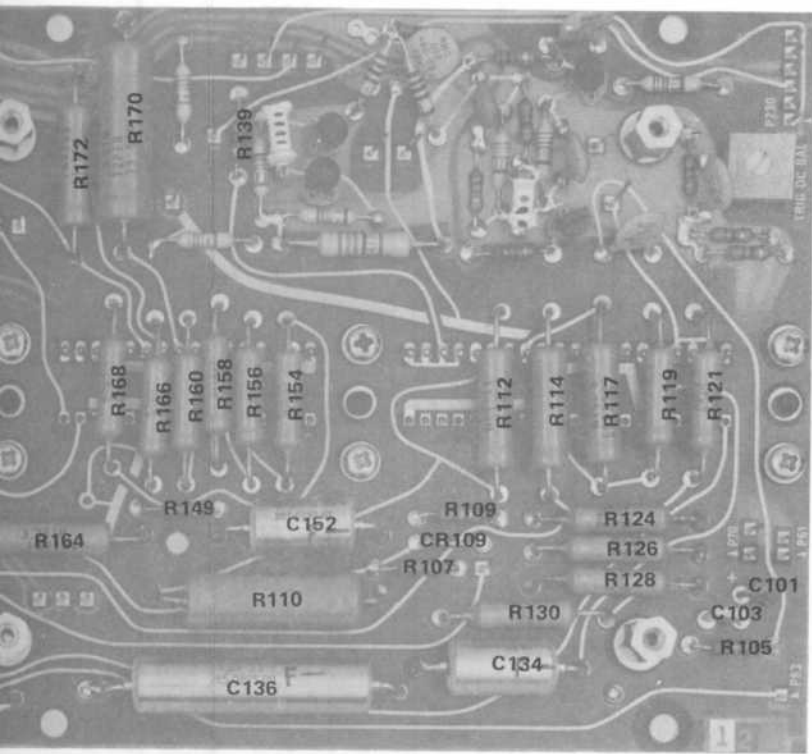


Fig. 8-18. Partial A1— Interface circuit board (7B53AN only) component l

D E F G



C138 (BACK OF BOARD)

(7B53AN only) component locator.

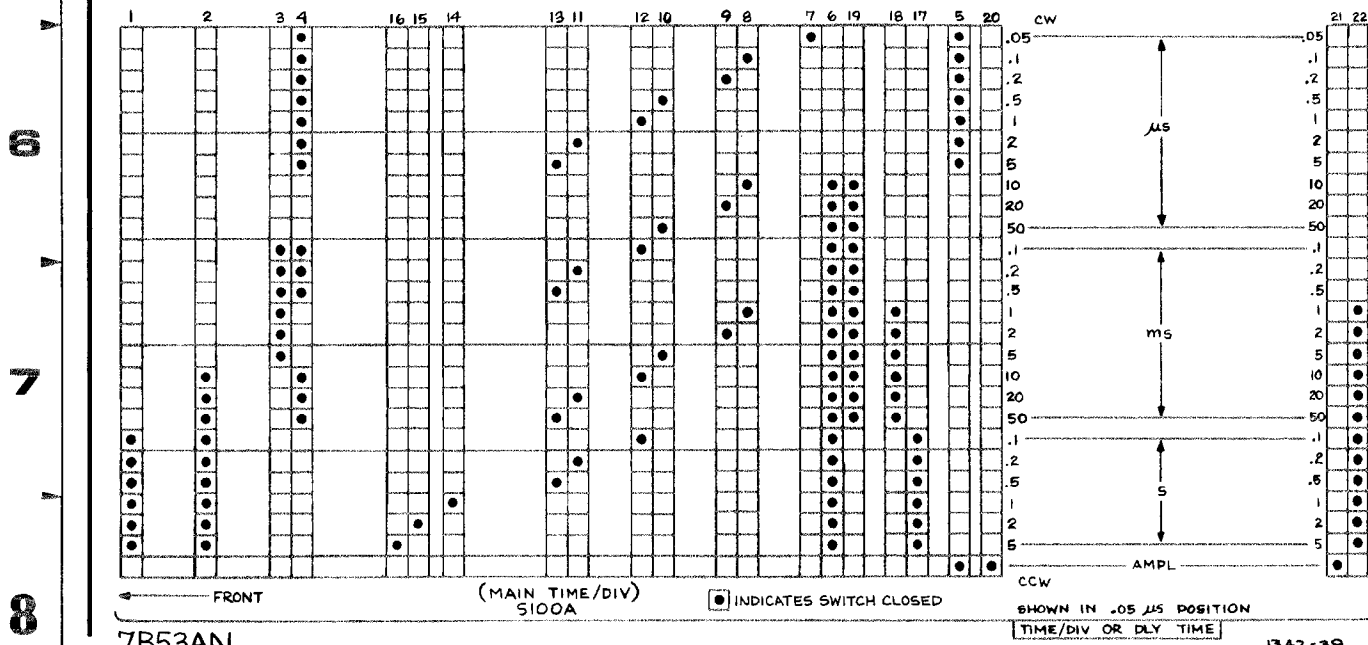
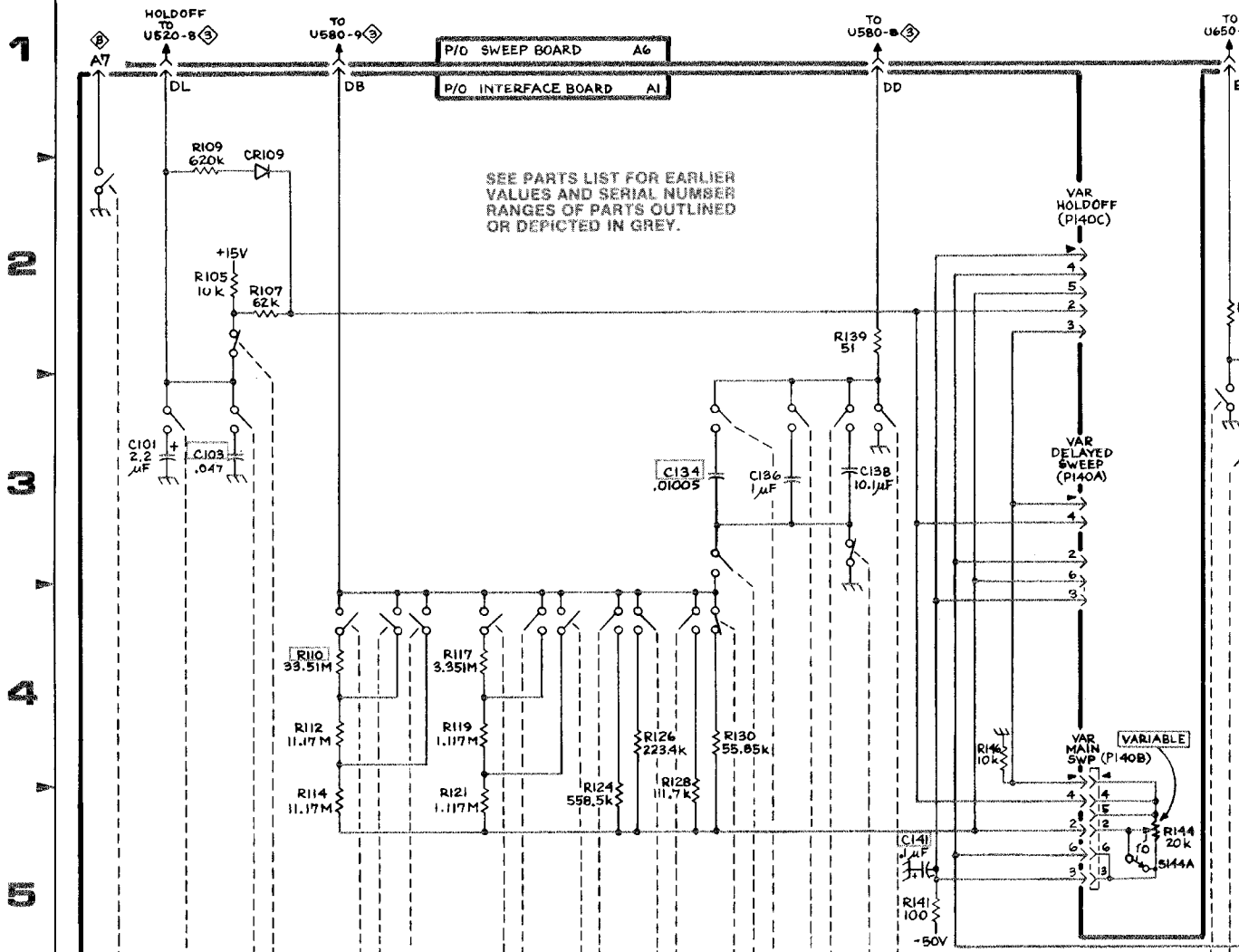
1342-66

 **Static Sensitive Devices**
See Maintenance Section

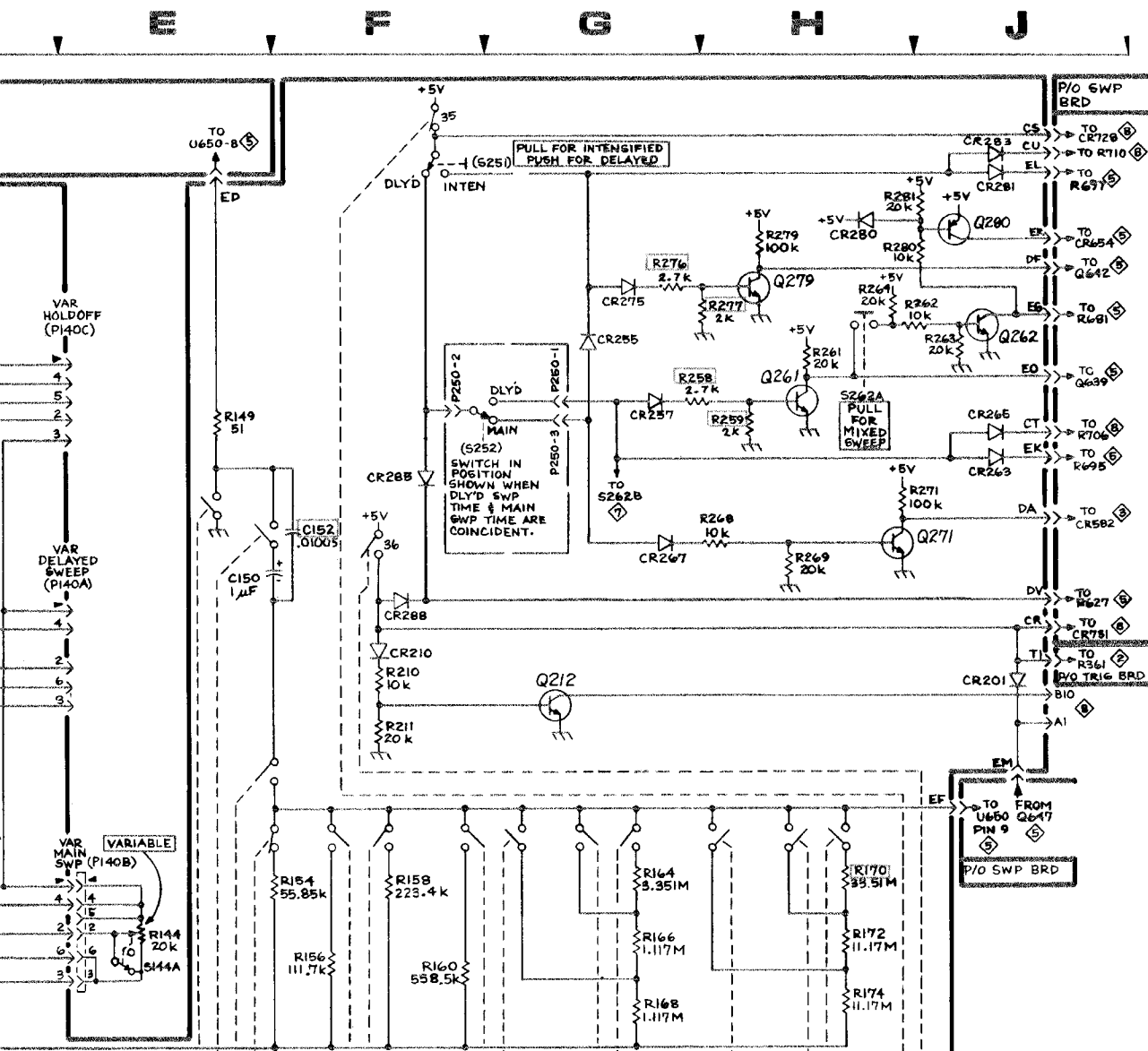
P/O A1 ASSY			Timing Switches 7B53AN		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C101	A3	G3	R121	B5	F2
C103	A3	G3	R124	B5	F3
C134	C3	F3	R126	B5	F3
C136	C3	E3	R128	C5	F3
C138	C3	F3*	R130	C5	F3
C141	D5	D2	R139	D3	E1
C150	E3	D3	R141	D5	D2
C152	F3	E3	R146	D5	B2
			R149	E3	E3
CR109	A2	F3	R154	E5	E2
CR201	J4	D3	R158	F5	E2
CR210	F4	D3	R160	F5	E2
CR255	G2	D2	R164	G5	D3
CR257	G2	C3	R166	G5	D2
CR263	J3	C3	R168	G5	D2
CR265	J3	C2	R170	H5	D1
CR267	G3	C2	R172	H5	D1
CR280	H2	B2	R174	H5	D1
CR281	J1	C3	R210	F4	C3
CR283	J1	C2	R211	F4	C3
CR285	F3	D3	R258	G2	C3
CR288	F3	D3	R259	H3	D3
			R261	H2	C3
P140B	E5		R262	H2	B2
			R263	J2	B1
Q212	G4	C3	R264	H2	B2
Q261	H2	C3	R268	H3	C2
Q262	J2	B2	R269	H3	C1
Q271	H3	C2	R271	H3	C2
Q279	H2	C1	R276	G2	D2
Q280	J2	B2	R277	H2	C1
			R279	H2	C1
R105	A2	G3	R280	H2	B2
R107	A3	E3	R281	H2	B2
R109	A2	F3			
R110	A4	E3	S251	F1	D2
R112	A5	F2	S262A	H2	B2
R114	A5	F2			
R117	B4	F2			
R119	B5	F2	S144A	E5	CHASSIS

*See Parts List for serial number ranges.

A B C D E

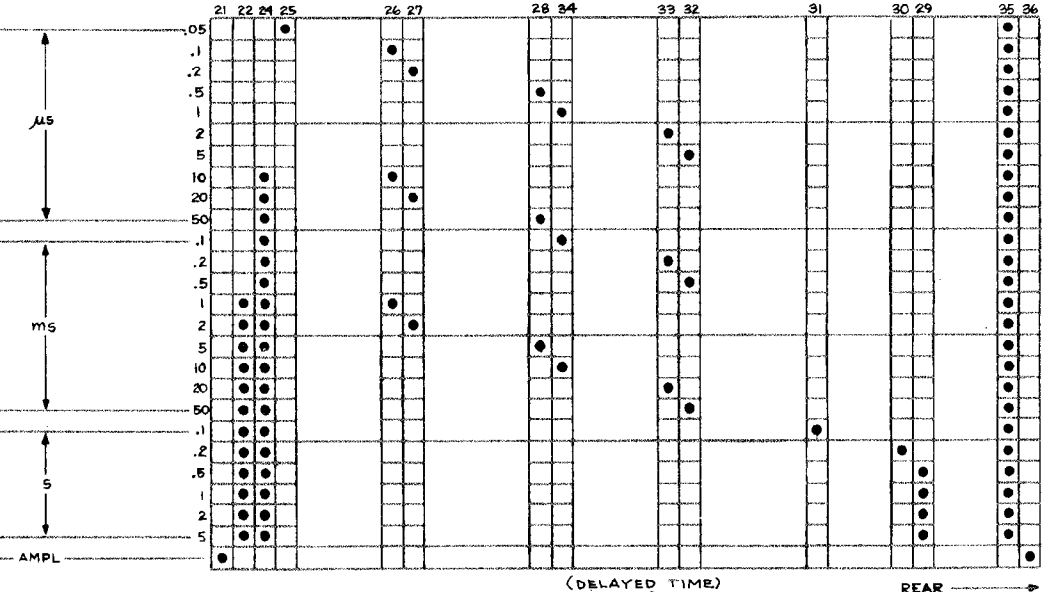


7B53AN



NOTE: P/O INDICATES PART OF.

⊗ Static Sensitive Devices See Maintenance Section



(DELAYED TIME) S100B REAR

0.05 μs POSITION FOR DLY TIME

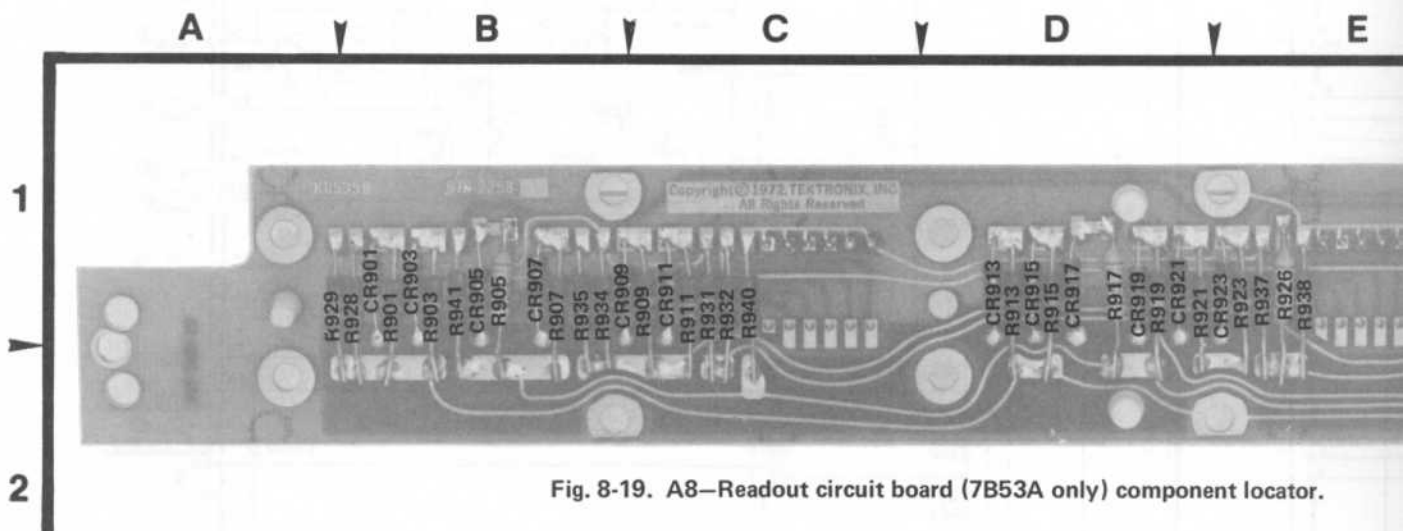
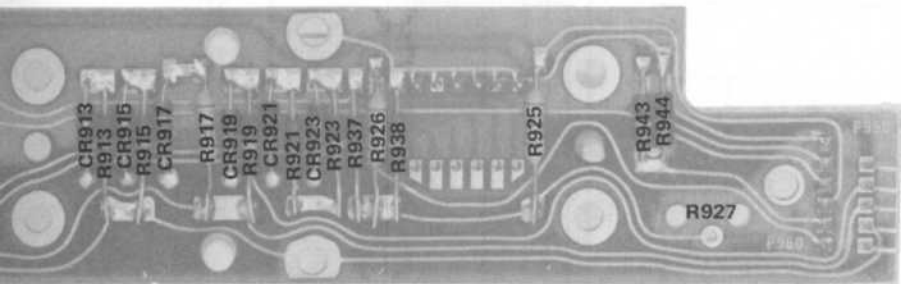


Fig. 8-19. A8—Readout circuit board (7B53A only) component locator.

▼ D ▼ E ▼ F ▼ G






1342-67A

board (7B53A only) component locator.



Static Sensitive Devices
See Maintenance Section

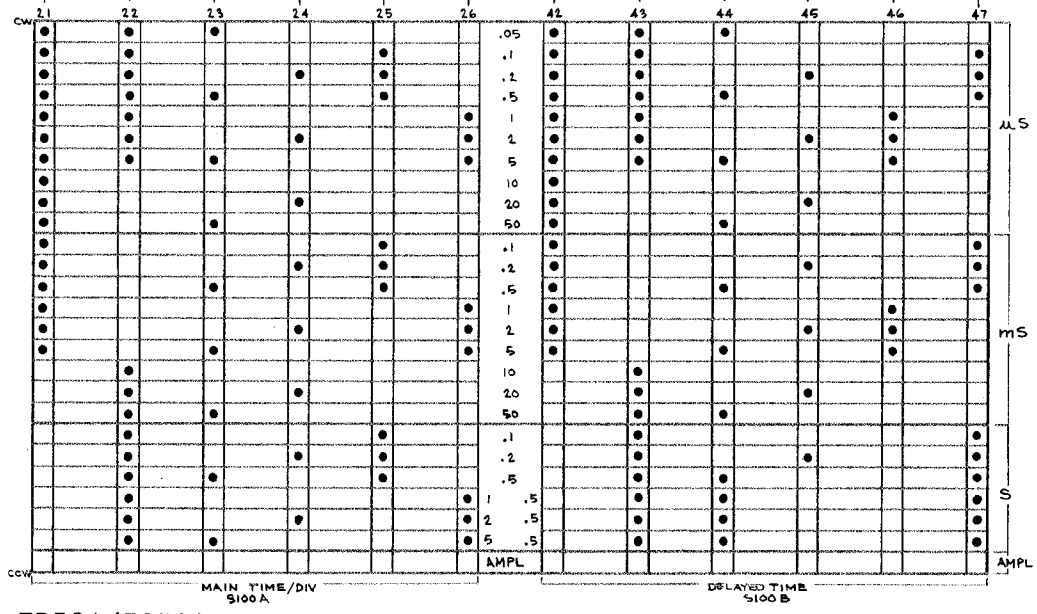
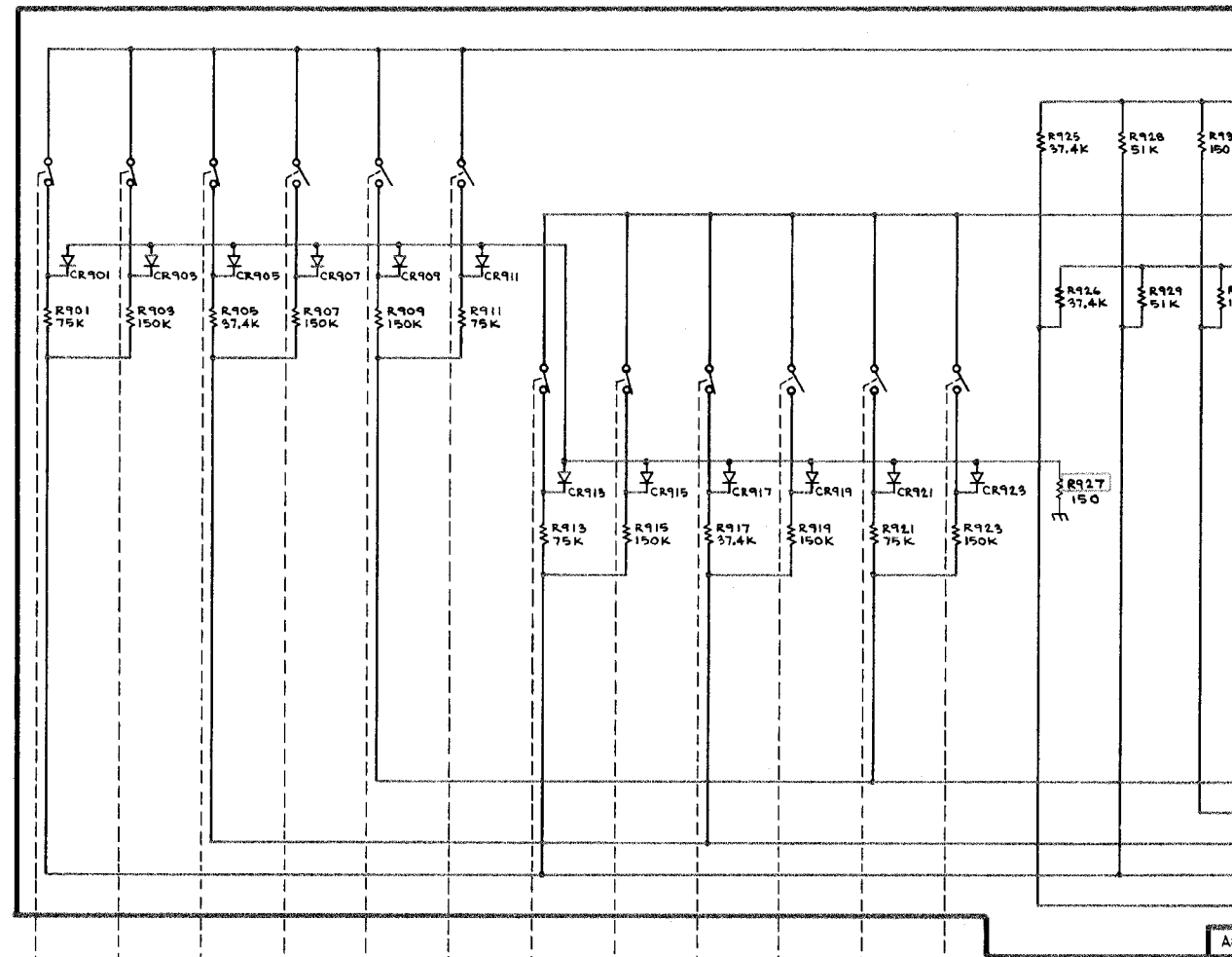
P/O A1 ASSY See Fig. 8.17			Readout Switching 		
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR182	H3	B1	R181 *	H3	A1
CR184	H2	B1	R182	H4	B2
CR185	H1	B1	R184	H2	B1
CR187	H2	C3	R185	H1	B1
CR188	H1	B2	R186	H2	C2
P/O A6 ASSY See Fig. 8.20			Readout Switching 		
S762B	G4	A2			
P/O A8 ASSY			Readout Switching 		
CR901	A2	B1	R917	C4	D1
CR903	A2	B1	R919	C4	D1
CR905	A2	B1	R921	D4	D1
CR907	A2	B1	R923	D4	E1
CR909	B2	B1	R925	D2	E1
CR911	B2	C1	R926	D3	E1
CR913	B3	D1	R927 **	D3	F1
CR915	C3	D1	R928	E2	B1
CR917	C3	D1	R929	E3	B1
CR919	C3	D1	R931	E2	C1
CR921	D3	D1	R932	E3	C1
CR923	D3	E1	R934	E2	B1
R901	A3	B1	R935	E3	B1
R903	A3	B1	R937	F2	E1
R905	A3	B1	R938	F2	E1
R907	A3	B1	R940	F2	C1
R909	B3	C1	R941	F2	B1
R911	B3	C1	R943	F2	F1
R913	B4	D1	R944	F2	F1
R915	C4	D1	S144B	J4	CHASSIS

*See Parts List for serial number ranges.

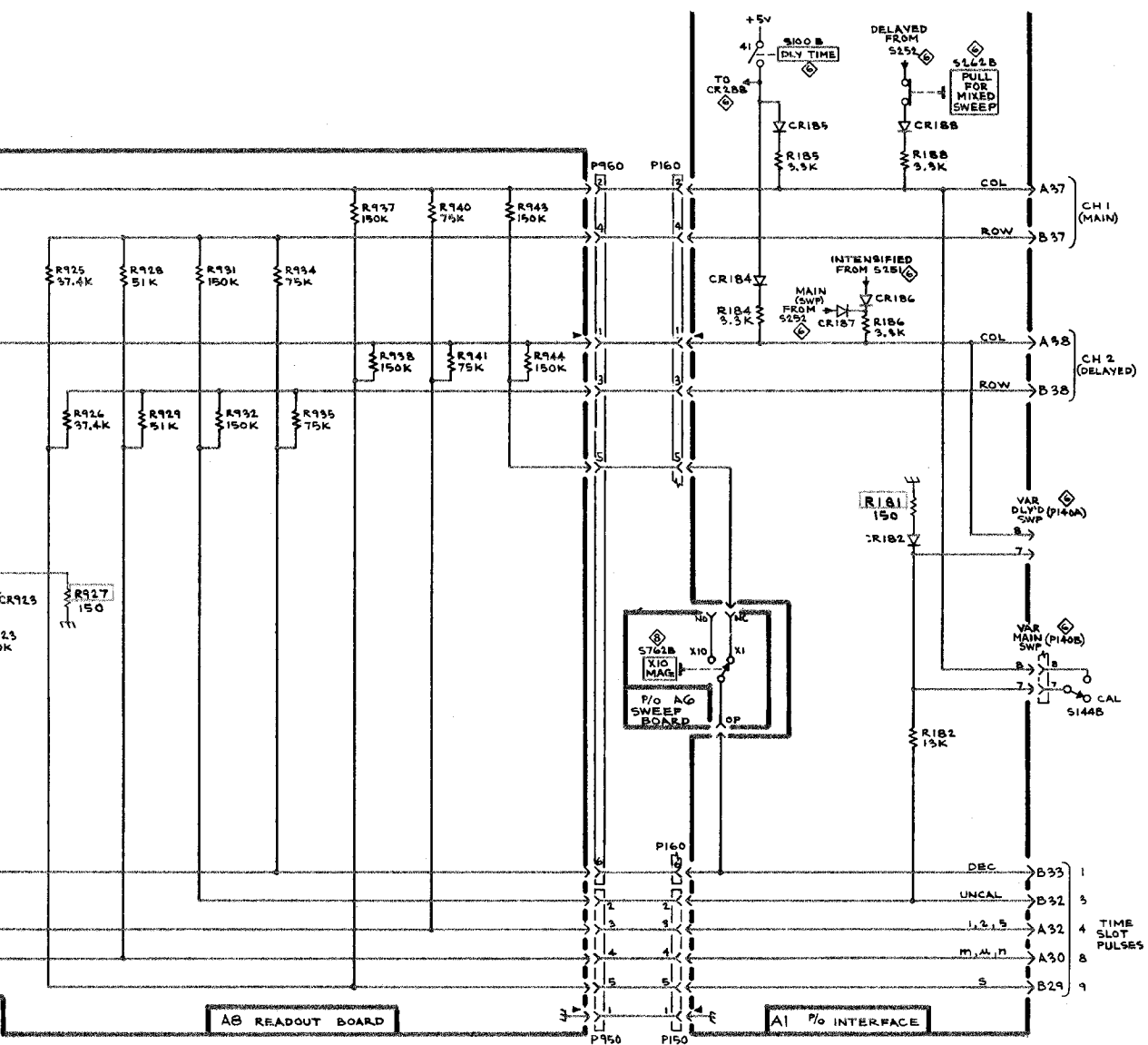
**Located on back of board (SN B192519 & below)

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7B53A/7B53AN



7853A READOUT SWITCHING



NOTE:
 P/O INDICATES PART OF
 Static Sensitive Devices
 See Maintenance Section

SEE PARTS LIST FOR EARLIER
 VALUES AND SERIAL NUMBER
 RANGES OF PARTS OUTLINED
 OR DEPICTED IN GREY.



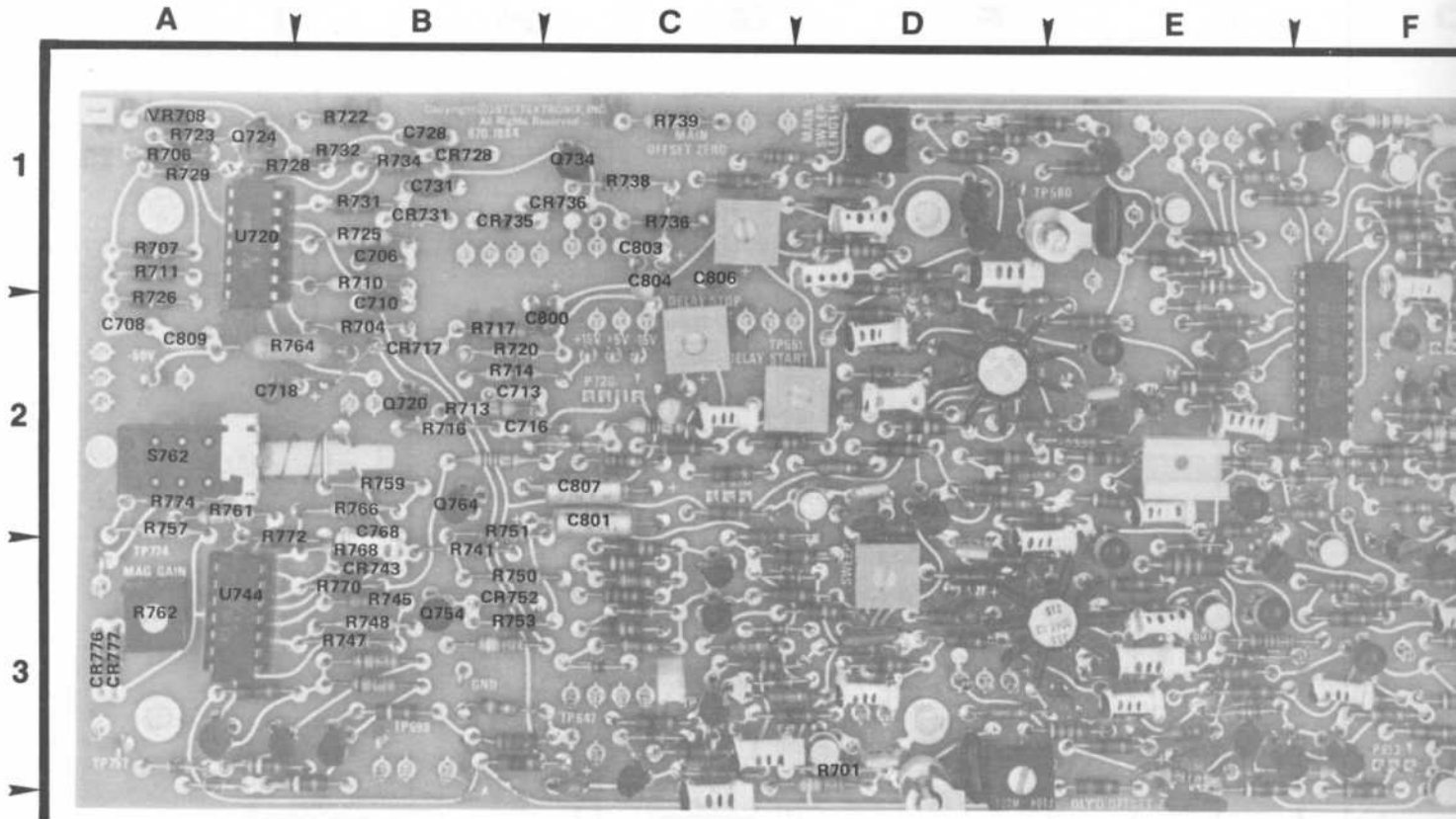


Fig. 8-20. Partial A6-Sweep circuit board component locator (SN B090000 and up).

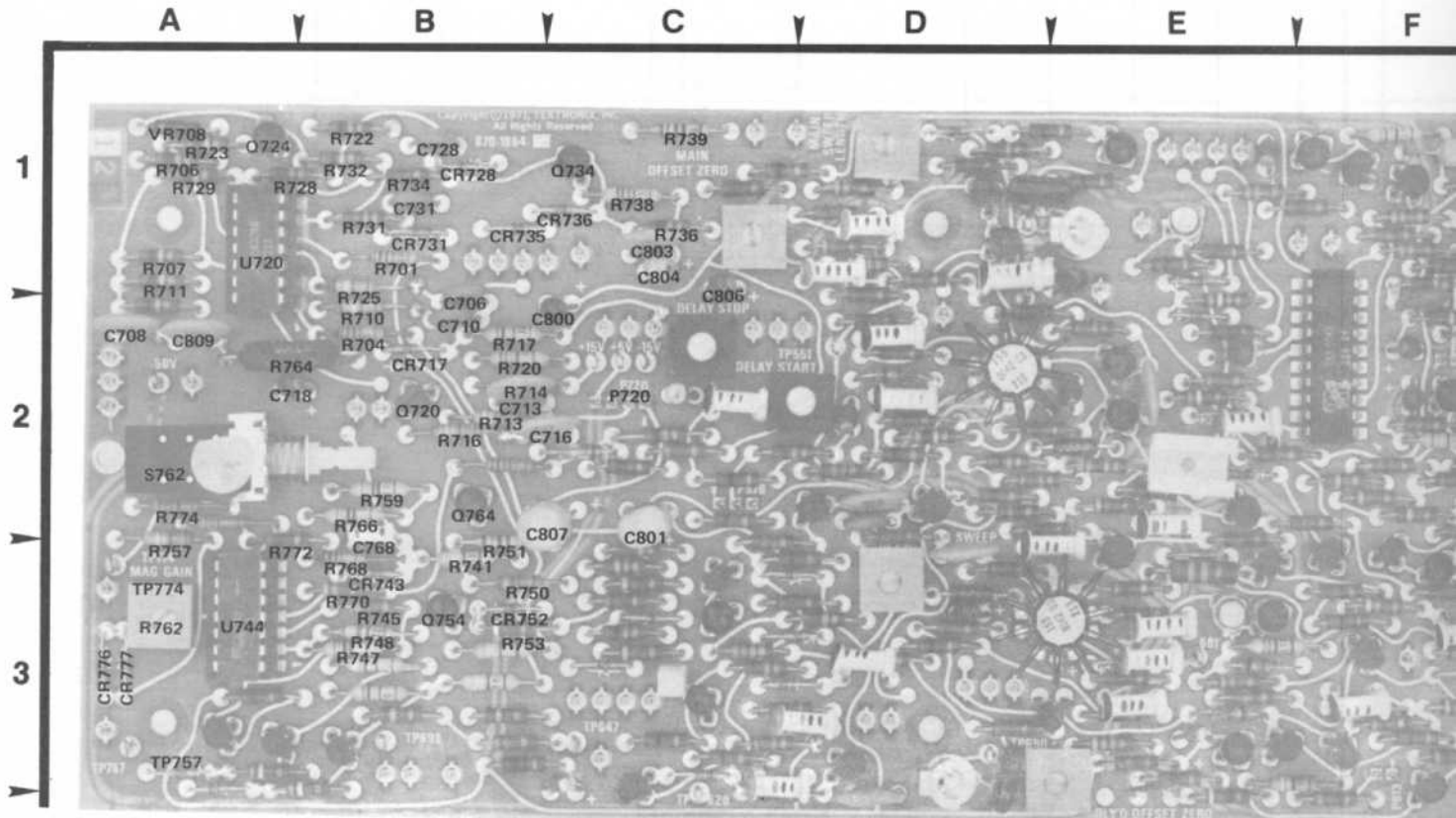
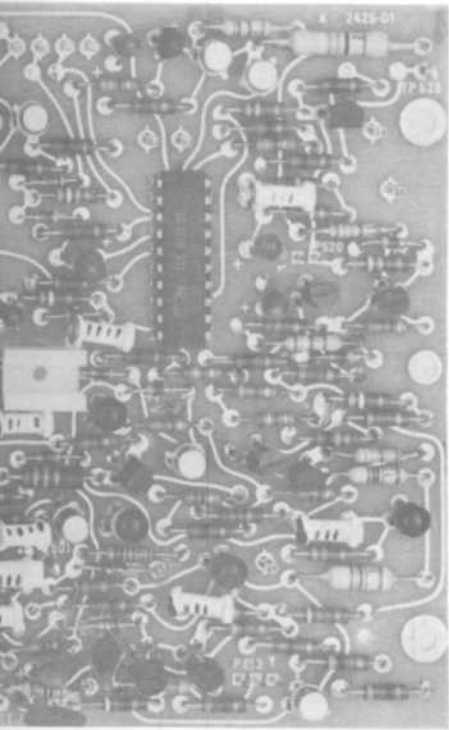


Fig. 8-21. Partial A6-Sweep circuit board component locator (SN B089999 and below).

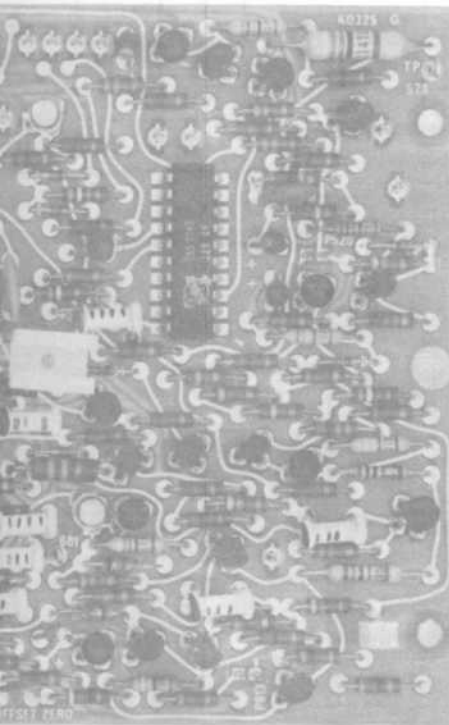
Fig. 8-20 & 8-21

E F G



0 and up).

E F G



99 and below).



Static Sensitive Devices
See Maintenance Section

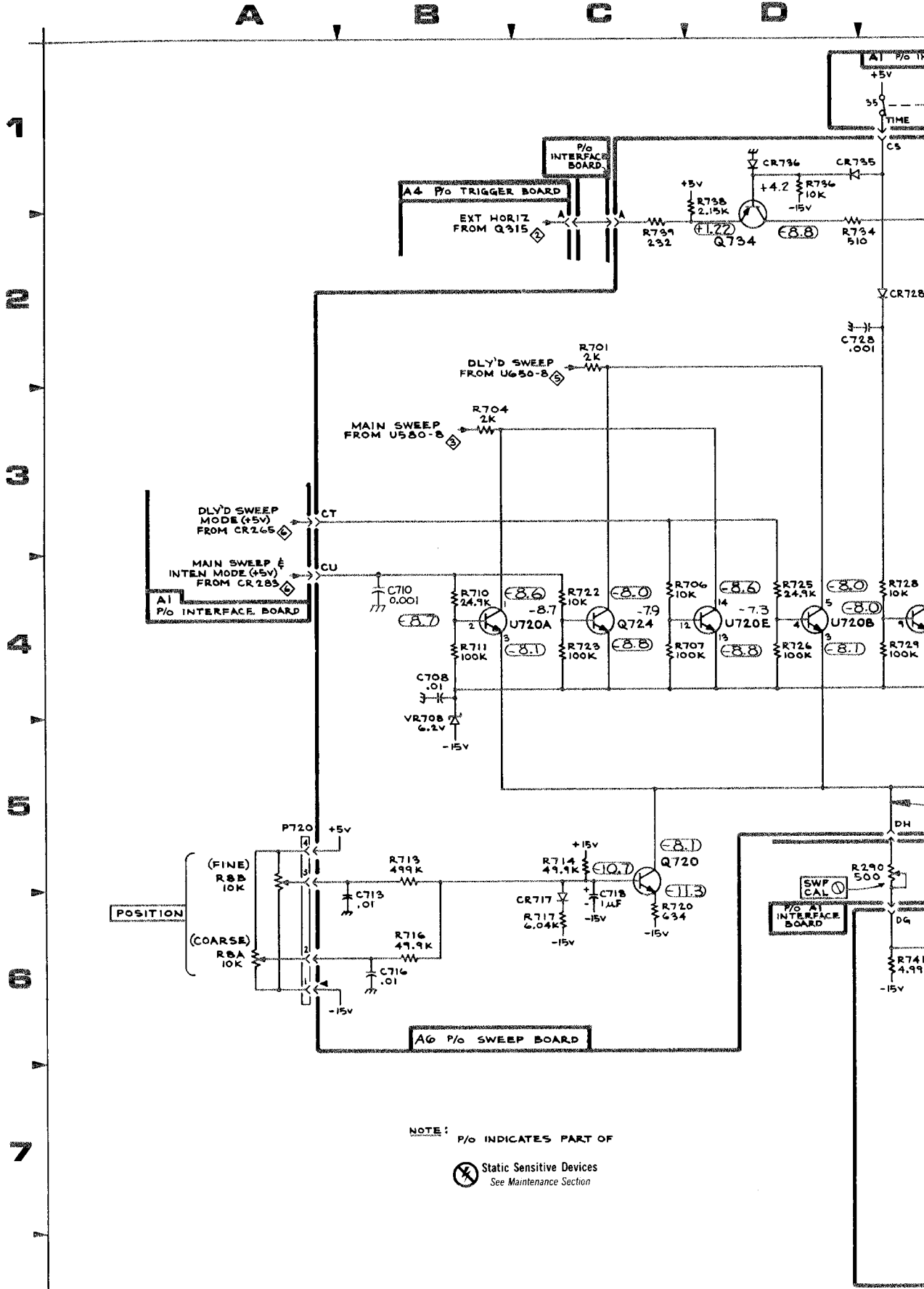
P/O A6 ASSY
(SN B010000 & up)

Horizontal Preamp 

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C708	B5	A2	R734	E2	B1
C710	B4	B2	R736	D2	C1
C713	B6	B2	R738	D2	C1
C716	B6	B2	R739	D2	C1
C718	C6	A2	R741	E7	B3
C728	E3	B1	R745	F8	B3
C731	E3	B1	R747	F8	B3
C768	F7	B3	R748	F8	B3
			R750	F7	B3
			R751	F8	B3
			R753	F7	B3
			R757	G8	A3
CR717	C6	B2	R759	G7	B2
CR728	E3	B1	R761	G7	A3
CR731	F3	B1	R762	G7	A3
CR735	E2	A3	R764	F7	A2
CR736	D2	C1	R766	G7	B2
CR743	E6	B3	R768	F7	B3
CR752	F7	B3	R770	F6	B3
CR776	H7	A3	R772	G6	B3
CR777	H7	A3	R774	G6	A2
Q720	C6	B2			
Q724	C4	A1			
Q734	D2	C1			
Q754	F8	B3			
Q764	G7	B2	S762A	G7	A1
R701*	C3	D3			
R704	C3	B2			
R706	D4	A1	U720A	C5	A1
R707	D5	A1	U720B	D5	A1
R710	B4	B2	U720C	F5	A1
R711	B5	A2	U720D	E5	A1
R713	B6	B2	U720E	D5	A1
R714	C6	B2	U744A	F8	A3
R716	B6	B2	U744B	F6	A3
R717	C6	B2	U744C	G6	A3
R720	D6	B2	U744D	G8	A3
R722	C4	B1			
R723	C5	A1			
R725*	D4	B1	VR708	B5	A1
R726	D5	A1			
R728	E4	A1	R008A	A6	CHASSIS
R729	E5	A1	R008B	A6	CHASSIS
R731	F4	A3			
R732	F5	B1			

*Board location of parts (SN B089999 & below)

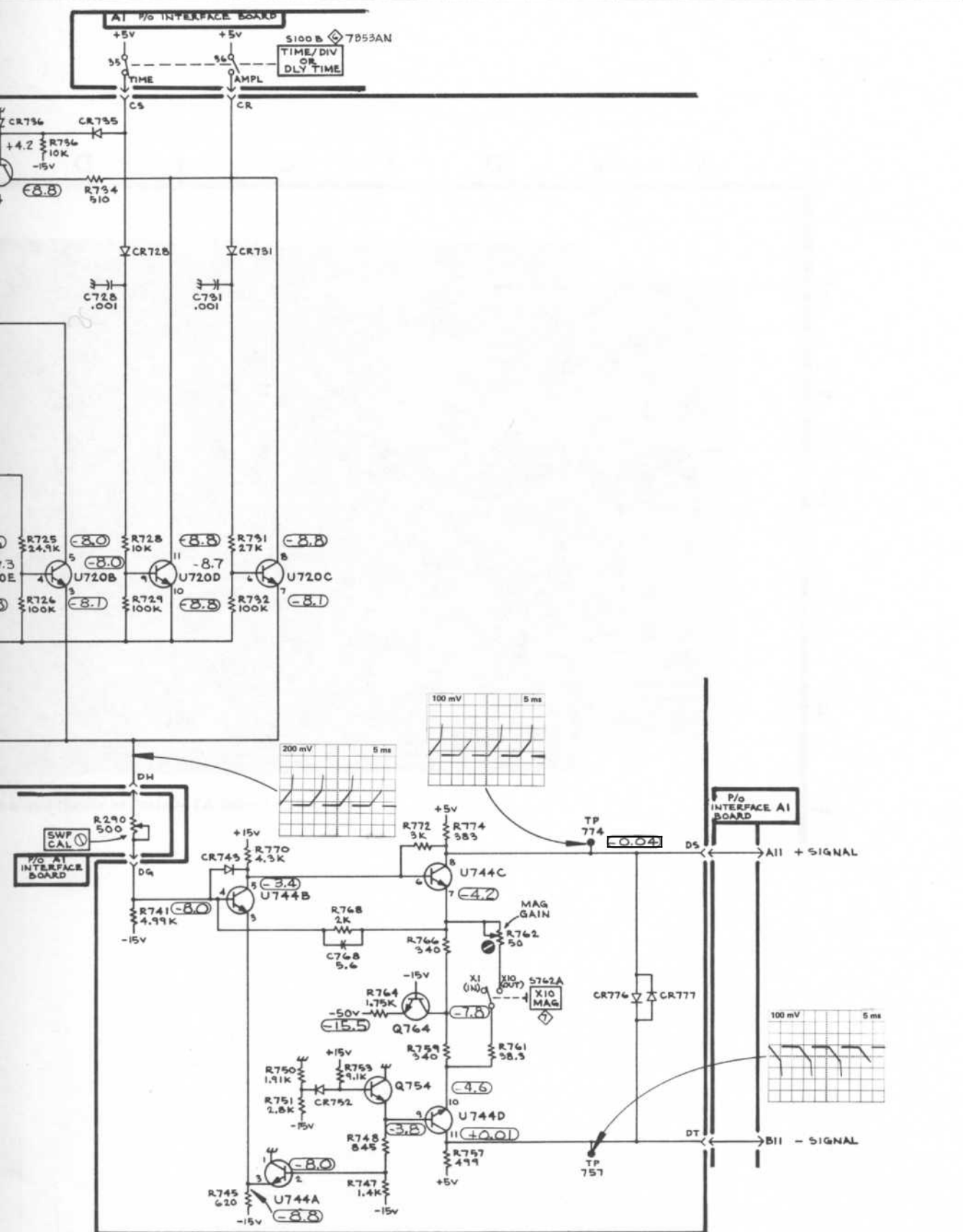
R701 D3
R725 B1



NOTE: P/O INDICATES PART OF

Static Sensitive Devices
See Maintenance Section

D E F G H J



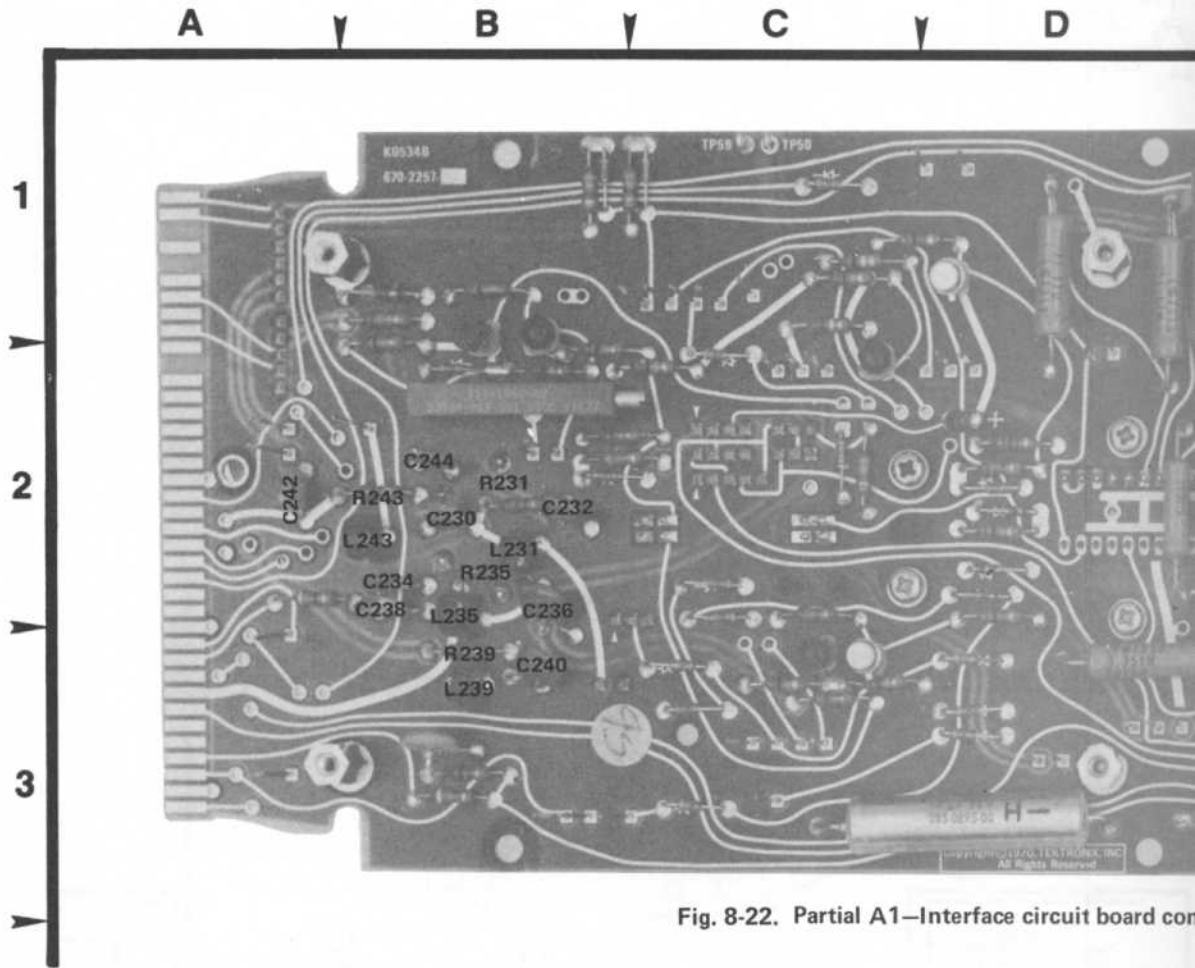


Fig. 8-22. Partial A1—Interface circuit board con

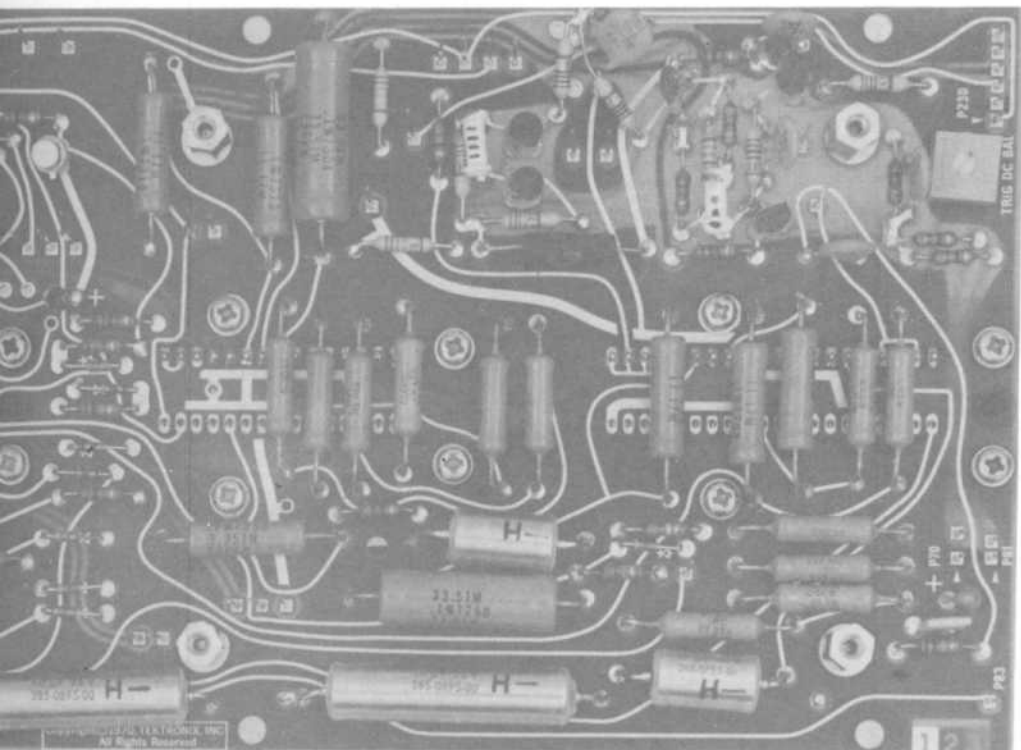
2

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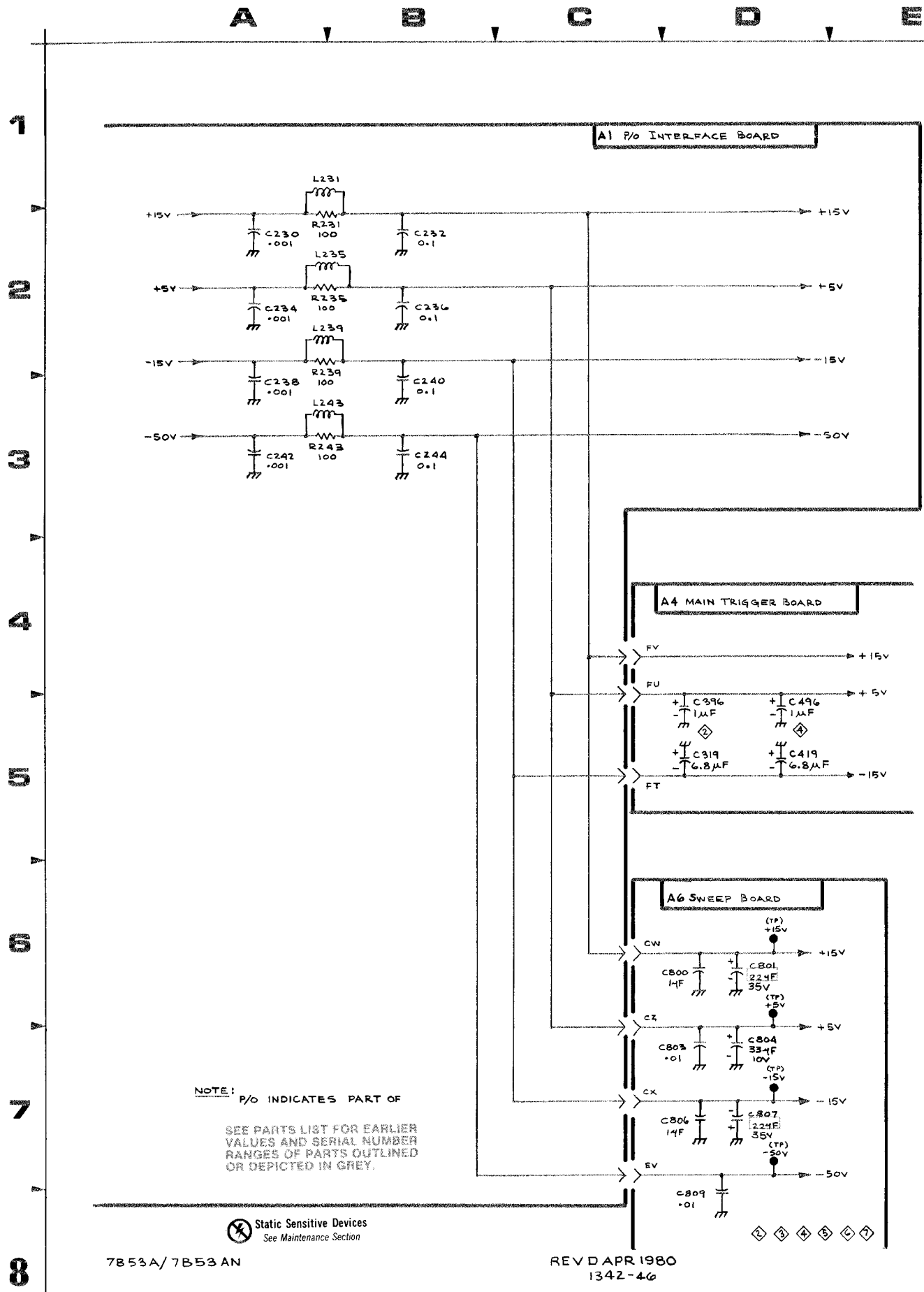
G



1-Interface circuit board component locator.

1342-70

P/O A1 ASSY		Voltage Distribution & Output Connectors	9
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	
C230	A2	B2	
C232	B2	B2	
C234	A2	B2	
C236	B2	B2	
C238	A3	B2	
C240	B3	B3	
C242	A3	A2	
C244	B3	B2	
L231	B1	B2	
L235	B2	B3	
L239	B2	B3	
L243	A3	A2	
R231	B2	B2	
R235	B2	B2	
R239	A3	B3	
R243	A3	B2	
P/O A4 ASSY See Fig. 8.8 & 8.14		Voltage Distribution & Output Connectors	9
C319	D5	A2	
C396	D5	C1	
C419	D5	F2	
C496	D5	E1	
P/O A6 ASSY See Fig. 8.20 & 8.21		Voltage Distribution & Output Connectors	9
C800	D6	C2	
C801	D6	C2	
C803	D7	C1	
C804	D7	C1	
C806	D7	C1	
C807	D7	C2	
C809	D8	A2	



NOTE: P/O INDICATES PART OF

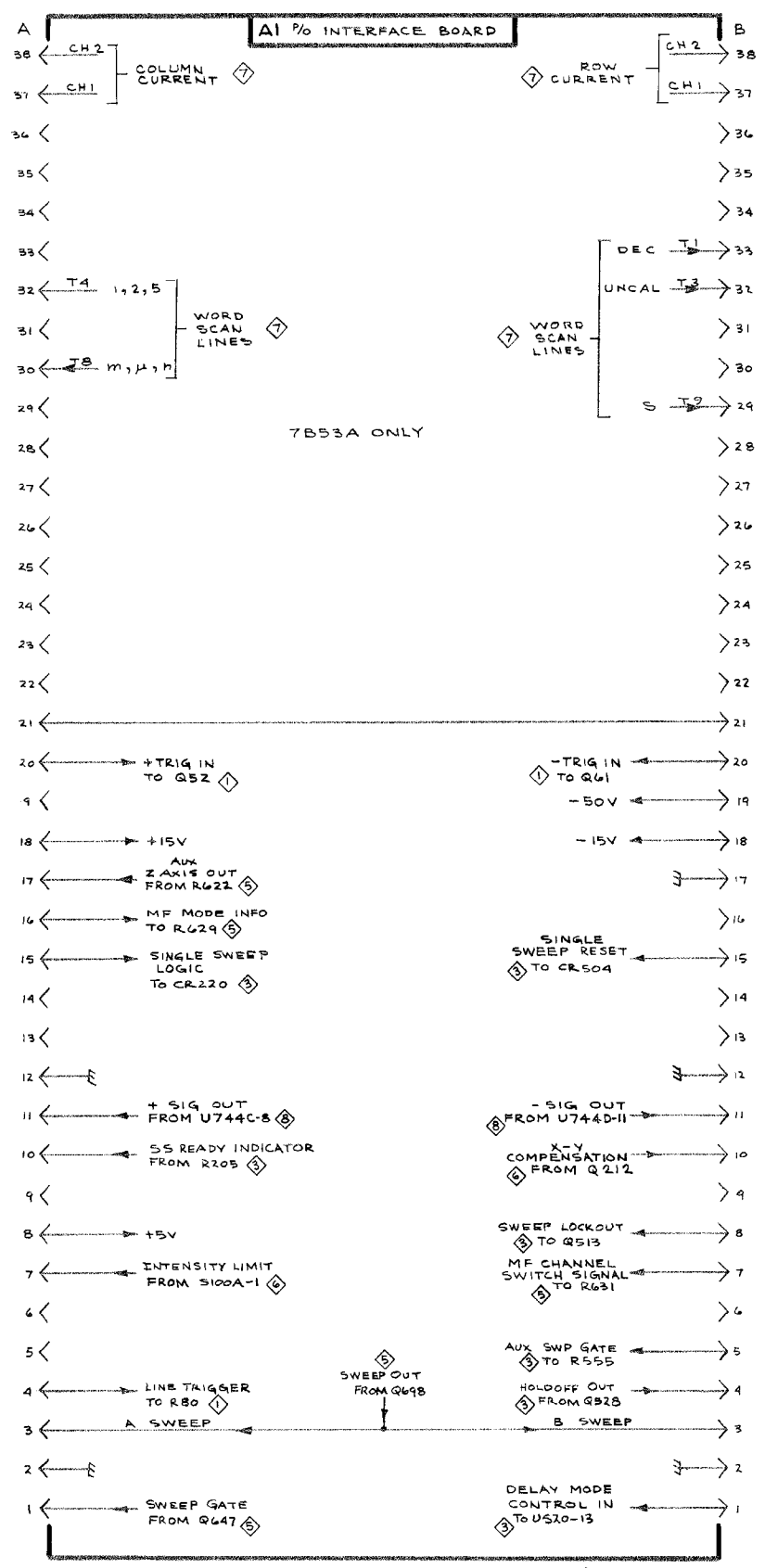
SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY.

⚡ Static Sensitive Devices
See Maintenance Section

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A B C D E

E F G H J



VOLTAGE DISTRIBUTION & OUTPUT CONNECTORS 9

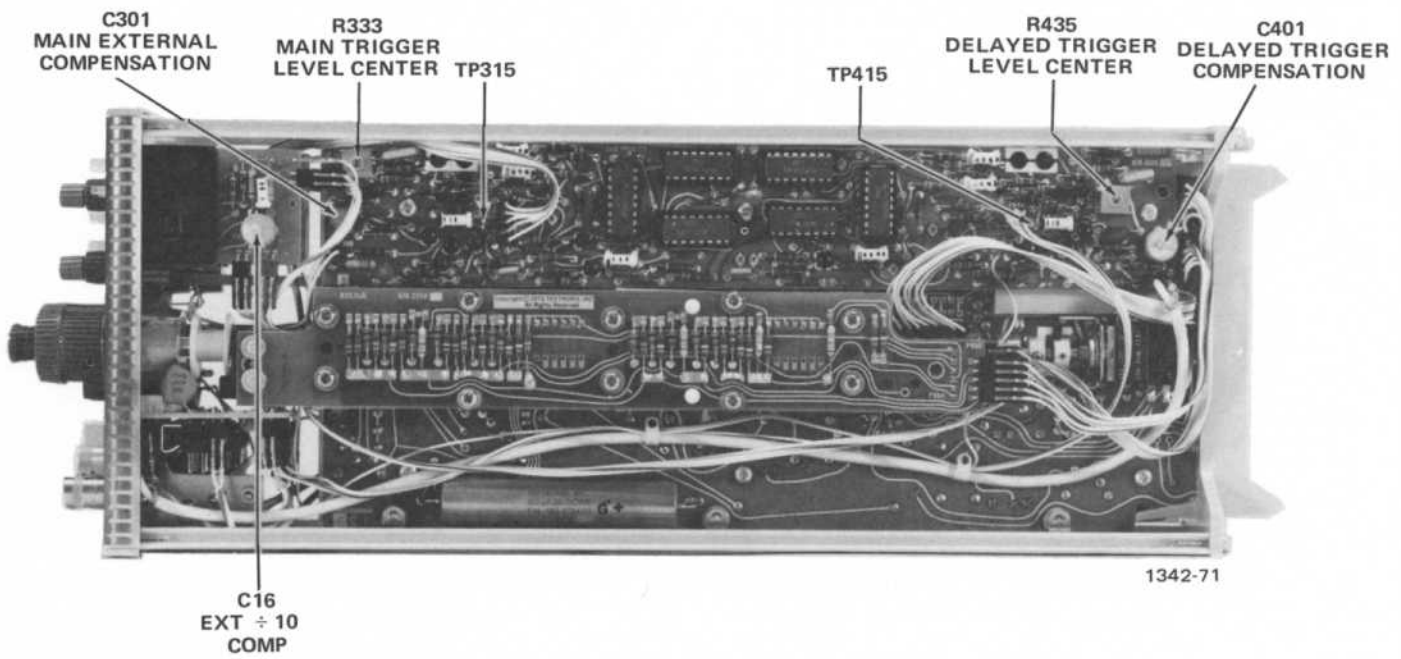


Fig. 8-23. Location of adjustments in the 7B53A/7B53AN (SN B209999 and below).

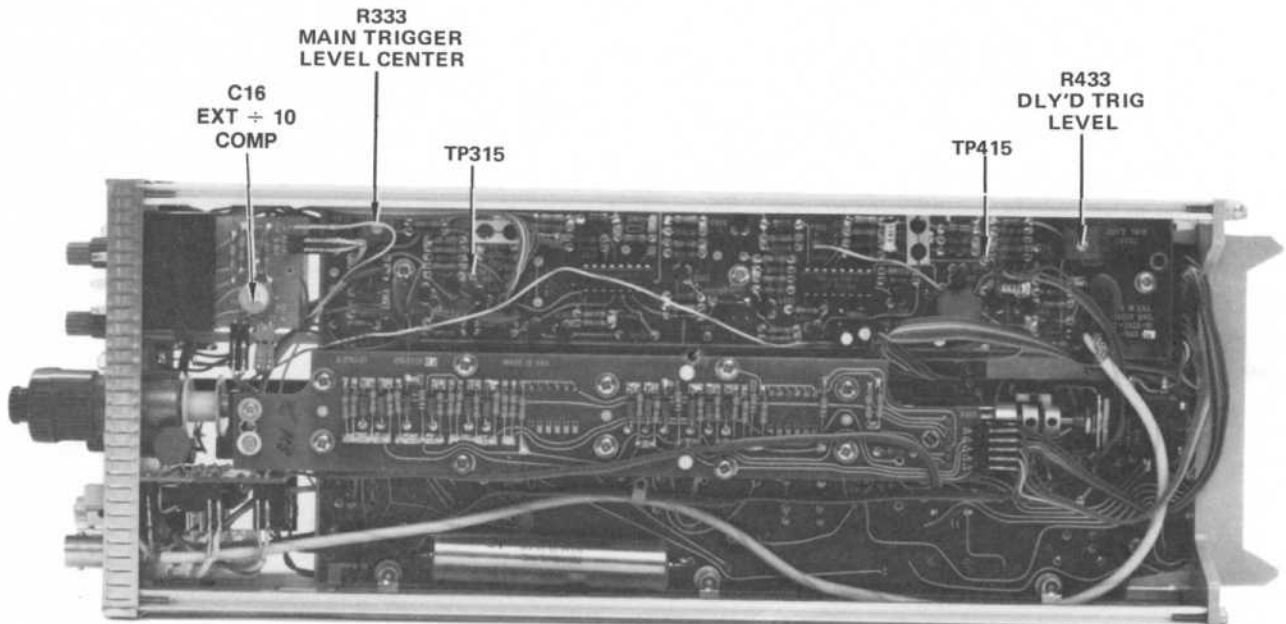
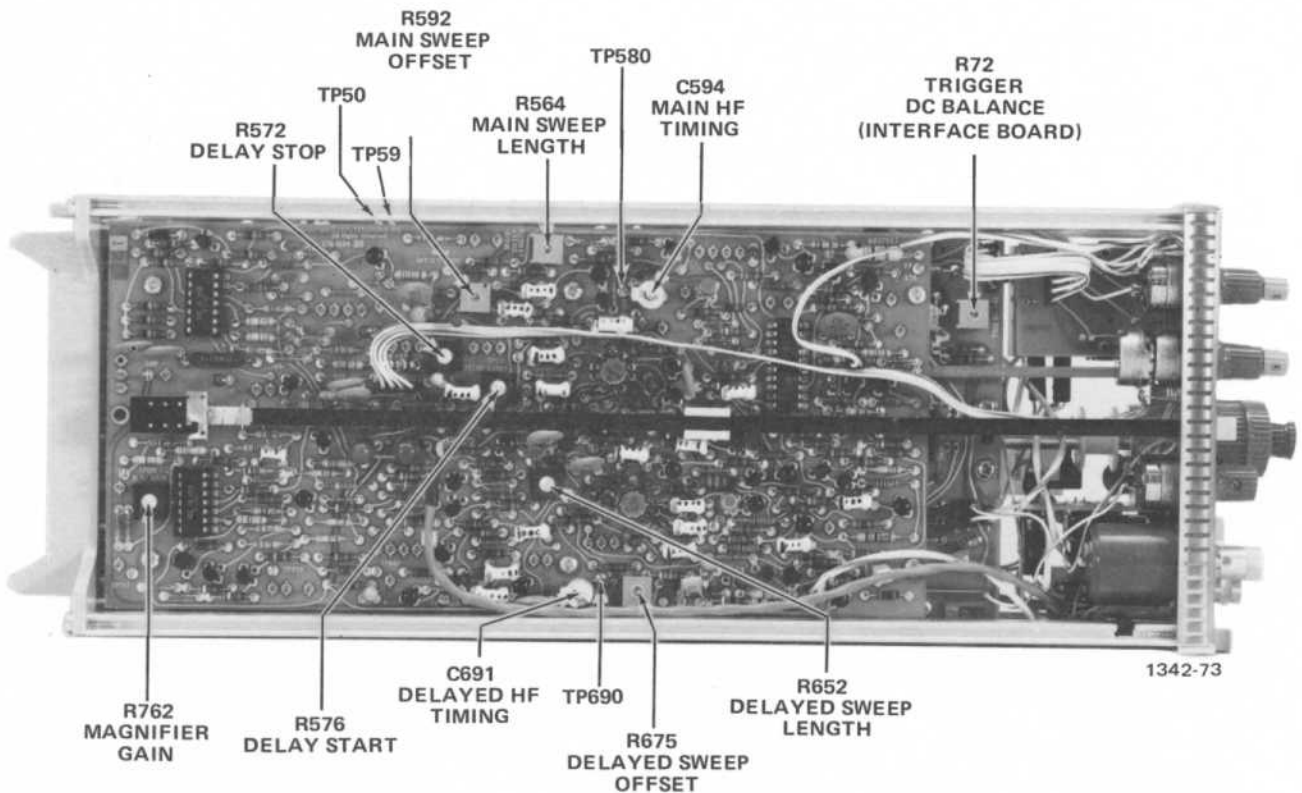


Fig. 8-24. Location of adjustments in the 7B53A (SN B210000 and up).

1342-72A

ADJUSTMENT LOCATIONS



1342-73

Fig. 8-25. Location of adjustments in the 7B53A/7B53AN.

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 *Name & Description*

Assembly and/or Component

Attaching parts for Assembly and/or Component

---*---

Detail Part of Assembly and/or Component

Attaching parts for Detail Part

---*---

Parts of Detail Part

Attaching parts for Parts of Detail Part

---*---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U. S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

INCH	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EOPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SO	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
01963	CHERRY ELECTRICAL PRODUCTS CORP	3600 SUNSET AVE	WAUKEGAN IL 60087-3214
05129	KILO ENGINEERING CO	2118 D ST	LA VERNE CA 91750-5422
05820	EG AND G WAKEFIELD ENGINEERING	60 AUDUBON RD	WAKEFIELD MA 01880-1203
06950	SCREWCORP VSI AEROSPACE PRODUCTS DIV SUB OF FAIRCHILD INDUSTRIES INC	13001 E TEMPLE AVE PO BOX 730	CITY OF INDUSTRY CA 91746-1417
07416	NELSON NAME PLATE CO	3191 CASITAS	LOS ANGELES CA 90039-2410
08261	SPECTRA-STRIP AN ELTRA CO	7100 LAMPSON AVE	GARDEN GROVE CA 92642
09772	WEST COAST LOCKWASHER CO INC	16730 E JOHNSON DRIVE P O BOX 3588	CITY OF INDUSTRY CA 91744
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
10389	LICON DIV OF ILLINOIS TOOL WORKS INC	1714 N DAMEN AVE	CHICAGO IL 60647-5509
12327	FREEMAN CORP	9301 ALLEN DR	CLEVELAND OH 44125-4632
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
18310	CONCORD ELECTRONICS CORP	37 GREAT JONES ST	NEW YORK NY 10012-1115
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS DIV MILITARY PRODUCTS GROUP	515 FISHING CREEK RD	NEW CUMBERLAND PA 17070-3007
22599	AMERACE CORP ESNA DIV	15201 BURBANK BLVD SUITE C	VAN NUYS CA 91411-3532
28520	HEYCO MOLDED PRODUCTS	750 BOULEVARD P O BOX 160	KENILWORTH NJ 07033-1721
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
56878	SPS TECHNOLOGIES INC AEROSPACE & INDUSTRIAL PRODUCTS INC	HIGHLAND AVE	JENKINTOWN PA 19046
71785	TRW INC TRW CINCH CONNECTORS DIV	1501 MORSE AVE	ELK GROVE VILLAGE IL 60007-5723
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
74445	HOLO-KROME CO	31 BROOK ST	ELMWOOD CT 06110-2350
77900	SHAKEPROOF DIV OF ILLINOIS TOOL WORKS	SAINT CHARLES RD	ELGIN IL 60120
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
79136	WALDES KOHINOR IN	47-16 AUSTEL PLACE	LONG ISLAND CITY NY 11101-4402
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500 MS 53-111	BEAVERTON OR 97707-0001
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
87308	FARLEY METALS INC SOUTHERN SCREW DIV	BARKLEY RD P O BOX 1360	STATESVILLE NC 28677-9774
88245	WINCHESTER ELECTRONICS LITTON SYSTEMS-USECO DIV	13536 SATICOY ST	VAN NUYS CA 91409
91260	CONNOR SPRING AND MFG CO	1729 JUNCTION AVE	SAN JOSE CA 95112
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108-5181
TK0282	SONIC WIRE SALES INC	2698 MARINE WAY	MOUNTAINVIEW CA 94043-1126
TK0392	NORTHWEST FASTENER SALES INC	7923 SW CIRRRUS DRIVE	BEAVERTON OR 97005-6448
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609-3320
TK0507	O HARA METAL PRODUCTS CO	542 BRANNAN ST	SAN FRANCISCO CA 94107
TK1326	NORTHWEST FOURSLLIDE INC	18224 SW 100TH CT	TUALATIN OR 97062

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No.		Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Discort				
1-1	366-1391-02			1	KNOB:LT GY,0.081 ID X 0.28 OD X 0.32 H	80009	366-1391-02
-2	366-1077-00			1	KNOB:GRAY W/SETSCREW	80009	366-1077-00
	213-0153-00			1	.SETSCREW:5-40 X 0.125,STL	TK0392	ORDER BY DESCR
-3	366-1391-02			1	KNOB:LT GY,0.081 ID X 0.28 OD X 0.32 H	80009	366-1391-02
-4	366-1077-00			1	KNOB:GRAY W/SETSCREW	80009	366-1077-00
	213-0153-00			1	.SETSCREW:5-40 X 0.125,STL	TK0392	ORDER BY DESCR
-5	366-0494-00			1	KNOB:GRAY WITH SETSCREW	80009	366-0494-00
	213-0153-00			1	.SETSCREW:5-40 X 0.125,STL	TK0392	ORDER BY DESCR
	366-1405-05	B010100	B024024	1	KNOB:RED,CAL,0.082 ID X 0.45 OD X 0.466 H	80009	366-1405-05
-6	366-1405-00	B240250		1	KNOB:RED,CAL,0.08 ID X 0.45 OD X 0.466 H	80009	366-1405-00
	213-0153-00	B240250		1	.SETSCREW:5-40 X 0.125,STL	TK0392	ORDER BY DESCR
	366-2052-00	B240250		1	.KNOB:RED,CAL,0.08 ID X 0.45 OD X 0.456 H	80009	366-2052-00
-7	366-1321-00			1	KNOB:GY,DLYD,INTENS,0.203 ID X 0.976 OD	80009	366-1321-00
	213-0890-00			2	.SETSCREW:6-32 X 0.25 L,STL	56878	ORDER BY DESCR
-8	354-0410-00			1	RING,KNOB SKIRT:CLEAR,1.0 OD	80009	354-0410-00
	213-0004-00			2	.SETSCREW:6-32 X 0.188,STL	74445	ORDER BY DESCR
-9	366-1257-93			1	PUSH BUTTON:SIL GY,X1 X10	80009	366-1257-93
-10	366-1257-90			1	PUSH BUTTON:SIL GY,+	80009	366-1257-90
-11	366-1257-91			1	PUSH BUTTON:SIL GY,AC DC	80009	366-1257-91
-12	366-1257-92			1	PUSH BUTTON:SIL GY,INT EXT	80009	366-1257-92
-13	426-0681-00			4	FRAME,PUSH BTN:	80009	426-0681-00
-14	358-0378-00	B010100	B191549	1	BUSHING,SLEEVE:0.131 ID X 0.18 OD X 0.125 L	80009	358-0378-00
	358-0599-00	B191550		1	BUSHING,SLEEVE:0.125 ID X 0.25 OD X 0.234	28520	B-187-125
-15	366-1058-50			1	KNOB:GRAY,7B53A	80009	366-1058-50
	366-1058-35			1	KNOB:GRAY,7B53AN	80009	366-1058-35
-16	214-1095-00			1	PIN,SPRING:0.187 L X 0.094 OD,STL,CD PL	22599	52-022-094-0187
-17	337-1064-04	B010100	B238924	2	SHIELD,ELEC:SIDE FOR PLUG-IN UNIT	80009	337-1064-04
	337-1064-12	B238925		2	SHIELD,ELEC:SIDE FOR PLUG-IN UNIT	80009	337-1064-12
-18	333-1542-02			1	PANEL,FRONT:	80009	333-1542-02
-19	401-0126-00			1	BRG,KNOB SKIRT:DELRLN 0.861 ID X 0.975 OD X 0.125	80009	401-0126-00
-20	-----			1	RESISTOR,VAR:(SEE R9 REPL) (ATTACHING PARTS)		
-21	331-0247-00			1	DIAL,CONTROL:10 TURNS W/O BRAKE (END ATTACHING PARTS)	05129	771-S-1
-22	131-0955-00			2	.CONN,RCPT,ELEC:BNC,FEMALE (ATTACHING PARTS)	13511	31-279
-23	210-0590-00	B010100	B242519	2	NUT,PLAIN,HEX:0.375-32 X 0.438 BRS CD PL (END ATTACHING PARTS)	73743	28269-402
	210-0012-00	B010100	B242519	2	WASHER,LOCK:0.384 ID,INTL,0.022 THK,STL	09772	ORDER BY DESCR
-24	131-0373-00			1	TERMINAL,STUD:0.593 L (ATTACHING PARTS)	88245	MTS-7
-25	210-0405-00			1	NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL	73743	12157-50
-26	210-0001-00			1	WASHER,LOCK:#2 INTL,0.013 THK,STL (END ATTACHING PARTS)	77900	1202-00-00-0541C
-27	337-1317-00			1	SHIELD,ELEC:INPUT CONNECTOR	80009	337-1317-00
-28	-----			2	RESISTOR,VAR:(SEE R4,S4 REPL) (ATTACHING PARTS)		
-29	210-0583-00			2	NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
	210-0046-00			2	WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL (END ATTACHING PARTS)	77900	1214-05-00-0541C
-30	-----			1	RESISTOR,VAR:(SEE R8 REPL) (ATTACHING PARTS)		
-31	210-0583-00			1	NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
-32	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 OD X 0.02,STL	12327	ORDER BY DESCR
	210-0046-00			2	WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL (END ATTACHING PARTS)	77900	1214-05-00-0541C
-33	-----			1	CKT BOARD ASSY:DLY COUPLING(SEE A7 REPL)		
-34	131-0608-00			8	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
	131-0589-00			4	.TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
-35	260-1133-00			1	.SWITCH,PUSH:DP,1A,25VDC,3 BUTTON	31918	ORDER BY DESCR
-36	220-0637-00			1	.NUT BLOCK:2-56/4-40 X 1.050,AL (ATTACHING PARTS)	80009	220-0637-00
-37	211-0022-00			2	.SCREW,MACHINE:2-56 X 0.188,PNH,STL (END ATTACHING PARTS)	TK0435	ORDER BY DESCR
					(ATTACHING PARTS FOR CKT BD)		
-38	211-0101-00			2	SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL (END ATTACHING PARTS)	TK0435	ORDER BY DESCR

Replaceable Mechanical Parts - 7B53A/7B53AN

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-39	-----			1	CKT BOARD ASSY:TRIG SOURCE SW(SEE A2 REPL) (ATTACHING PARTS)		
	211-0156-00			2	SCREW,MACHINE:1-72 X 0.250,FLH,82 DEG,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-40	131-0589-00			7	CKT BOARD ASSY INCLUDES: .TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
-41	-----			1	CKT BD ASSY:TRIG COUPLING SW(SEE A3 REPL) (ATTACHING PARTS)		
-42	211-0156-00			2	SCREW,MACHINE:1-72 X 0.250,FLH,82 DEG,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-43	-----			1	CKT BOARD ASSY:TRIG MODE SW(SEE A5 REPL) (ATTACHING PARTS)		
	211-0156-00			2	SCREW,MACHINE:1-72 X 0.250,FLH,82 DEG,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
					CKT BOARD ASSY INCLUDES:		
-44	131-0608-00			6	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
-45	352-0157-00			1	LAMPHOLDER:(1)T-2 UNBASED,WHITE	80009	352-0157-00
-46	378-0602-00			1	LENS,LIGHT:GREEN	80009	378-0602-00
-47	200-0935-00			1	BASE,LAMPHOLDER:0.29 OD X 0.19 L,BK PLSTC	80009	200-0935-00
-48	386-1447-58			1	SUBPANEL,FRONT: (ATTACHING PARTS)	80009	386-1447-58
-49	213-0192-00	B010100	B220204	4	SCREW,TPG,TF:6-32 X 0.5,SPCL TYPE,FILH,STL	87308	ORDER BY DESCR
	213-0793-00	B220205		4	SCREW,TPG,TF:6-32 X 0.4375,TAPTITE,FILH (END ATTACHING PARTS)	83486	239-006-406043
-50	-----			1	CKT BOARD ASSY:TRIGGER(SEE A4 REPL)		
-51	131-0589-00			2	.TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
	131-0608-00			11	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
-52	136-0252-04	B010100	B113699	42	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0350-00	B113700	B209999	14	.SKT,PL-IN ELEK:TRANSISTOR,3 CONTACT	80009	136-0350-00
	136-0252-04	B210000		51	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-53	136-0263-03	B010100	B158929	9	.SOCKET,PIN TERM:U/W 0.025 SQ PINS	00779	85864-2
	136-0263-04	B158930		9	.SOCKET,PIN TERM:U/W 0.025 SQ PIN	22526	75377-001
-54	136-0260-02	B010100	B209999	6	.SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP	09922	D1LB16P-108T
	136-0260-02	B210000	B237199	2	.SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP	09922	D1LB16P-108T
	136-0729-00	B237200		2	.SKT,PL-IN ELEK:MICROCKT,16 CONTACT	09922	D1LB16P-108T
-55	200-0945-00			2	.COVER HALF,XSTR:DUAL TO-18 ALUMINUM	80009	200-0945-00
-56	200-0945-01			2	.COVER HALF,XSTR:DUAL TO-18 W/2-56 THD AL (ATTACHING PARTS)	80009	200-0945-01
-57	211-0062-00	B010100	B209999	2	.SCREW,MACHINE:2-56 X 0.312,PNH,STL	06950	ORDER BY DESCR
	211-0001-00	B210000		2	.SCREW,MACHINE:2-56 X 0.25,PNH,STL (END ATTACHING PARTS)	TK0435	ORDER BY DESCR
-58	214-0579-00	B010100	B209999	2	.TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	214-0579-00	B210000		3	.TERM,TEST POINT:BRS CD PL (ATTACHING PARTS FOR CKT BD)	80009	214-0579-00
-59	211-0008-00			3	SCREW,MACHINE:4-40 X 0.25,PNH,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-60	343-0088-00	B010100	B109999	2	CLAMP,CABLE:0.062 DIA,PLASTIC	80009	343-0088-00
	343-0088-00	B110000		1	CLAMP,CABLE:0.062 DIA,PLASTIC	80009	343-0088-00
-61	348-0235-00			2	SHLD GSKT,ELEK:FINGER TYPE,4.734 L	80009	348-0235-00
-62	105-0076-02	B010100	B237224	1	RELEASE BAR,LCH:PLUG-IN UNIT	80009	105-0076-02
	105-0076-04	B237225		1	RELEASE BAR,LCH:PLUG-IN UNIT	80009	105-0076-04
-63	214-1280-00			1	SPRING,HLCPS:0.14 OD X 1.126 L,TWIST LOOP	91260	ORDER BY DESCR
-64	214-1054-00			1	SPRING,FLAT:0.825 X 0.322,SST	TK1326	ORDER BY DESCR
-65	105-0075-00			1	BOLT,LATCH:	80009	105-0075-00
-66	-----			1	CKT BOARD ASSY:SWEEP(SEE A6 REPL)		
-67	131-0608-00	B010100	B089999	11	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
	131-0608-00	B090000		12	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
-68	136-0269-02	B010100	B237199	2	.SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP	09922	D1LB14P-108T
	136-0728-00	B237200		2	.SKT,PL-IN ELEK:MICROCKT,14 CONTACT	09922	D1LB14P-108
-69	136-0252-04	B010100	B113699	140	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-04	B113700	B148050	37	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0252-04	B148051		17	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0350-00	B148051	B217999	41	.SKT,PL-IN ELEK:TRANSISTOR,3 CONTACT	80009	136-0350-00
	136-0252-07	B218000		123	.SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
	136-0634-00	B148051	B237199	1	.SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	D1LB20P-108
	136-0752-00	B237200		1	.SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	D1LB20P-108
-70	136-0263-03	B010100	B158929	15	.SOCKET,PIN TERM:U/W 0.025 SQ PINS	00779	85864-2
	136-0263-04	B158930		45	.SOCKET,PIN TERM:U/W 0.025 SQ PIN	22526	75377-001

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No.		Qty	12345 Name & Description	Mfr.	
		Effective	Discont			Code	Mfr. Part No.
1-71	136-0241-00	B010100	B089999	2	.SKT, PL-IN ELEK:MICROCIRCUIT,10 CONT,PCB MT	71785	133-99-12-064
-72	214-0579-00	B010100	B089999	15	.TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	214-0579-00	B090000		16	.TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-73	214-1292-00			2	.HEAT SINK,XSTR:TO-5,SIL BRZ PTD BLACK	05820	205SB
-74	260-1208-00			1	.SWITCH,PUSH:DPDT,28VDC,PUSH-PUSH	31918	ORDER BY DESCR
-75	352-0240-00			1	.HOLDER,CABLE:0.125 DIA CA,HORIZ CKT BD MT	80009	352-0240-00
-76	386-2141-00			1	.SPRT,EXT SHAFT:PUSH SWITCH	80009	386-2141-00
-77	361-0007-00			1	.SPACER,SLEEVE:0.188 L X 0.111 ID,POLTHN (ATTACHING PARTS FOR CKT BD)	80009	361-0007-00
-78	211-0008-00			6	SCREW,MACHINE:4-40 X 0.25,PNH,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-79	384-1120-00			1	EXTENSION SHAFT:10.0 L X 0.123 OD,EPOXY GL	80009	384-1120-00
-80	376-0101-00			1	CPLG,SHAFT,RGD:0.125 ID X 0.312 OD,AL	80009	376-0101-00
-81	-----			1	CKT BOARD ASSY:TRIGGER SHIELD(SEE A9 REPL)		
-82	386-1556-00	B010100	B192519	1	.SUPPORT,CKT BD:0.215 H,ACETAL	80009	386-1556-00
	386-2228-00	B192520		1	.SUPPORT,CKT BD:DELRLN	80009	386-2228-00
-83	131-0937-00			2	.TERMINAL,LUG:SHLD GND,0.22 ID,PLAIN,BRS	80009	131-0937-00
	672-0049-00	B010100	B089999	1	CIRCUIT BD ASSY:TIME/DIV SW	80009	672-0049-00
	672-0049-01	B090000	B179999	1	CIRCUIT BD ASSY:TIME/DIV SW	80009	672-0049-01
	672-0049-02	B180000	B209999	1	CIRCUIT BD ASSY:TIME/DIV SW	80009	672-0049-02
	672-0049-04	B210000		1	CIRCUIT BD ASSY:TIME/DIV SW (ATTACHING PARTS)	80009	672-0049-04
-84	211-0008-00			6	SCREW,MACHINE:4-40 X 0.25,PNH,STL (END ATTACHING PARTS)	93907	ORDER BY DESCR
-85	384-0871-00	B010100	B179999	1	.SHAFT,CAM SW:9.426 L X 0.125 OD,INNER .CONCENTRIC W/DRIVER	80009	384-0871-00
	384-0882-02	B180000		1	.SHAFT,CAM SW:9.329 L X 0.125 OD INNER .CONCENTRIC W/DRIVER	80009	384-0882-02
-86	384-1153-00			1	.EXTENSION SHAFT:11.61 L X 0.081 OD,SST	80009	384-1153-00
-87	376-0129-01			1	.SPOOL,SW ACTR:0.128 & 0.203 ID,AL	80009	376-0129-01
	213-0075-00			2	..SETScrew:4-40 X 0.094,STL	74445	ORDER BY DESCR
-88	105-0340-00			1	.ACTUATOR,SWITCH:SLIDE SW	80009	105-0340-00
	213-0022-00			1	..SETScrew:4-40 X 0.188,STL	74445	ORDER BY DESCR
-89	376-0092-01			1	.CPLG HALF,SHAFT:0.125 ID,DELRLN	80009	376-0092-01
	213-0048-00			2	..SETScrew:4-40 X 0.125,STL	TK0392	ORDER BY DESCR
-90	376-0092-03			1	.CPLG HALF,SHAFT:0.125 ID,BLACK POLYAMIDE	80009	376-0092-03
	213-0048-00			2	..SETScrew:4-40 X 0.125,STL	TK0392	ORDER BY DESCR
-91	214-1630-00	B010100	B139999	1	.DETENT,SWITCH:	80009	214-1630-00
-92	-----			1	.SWITCH,SENS:(SEE S252 REPL) (ATTACHING PARTS)		
-93	211-0185-00			2	.SCREW,MACHINE:2-56 X 0.438,PNH,STL	TK0435	ORDER BY DESCR
-94	210-0850-00			2	.WASHER,FLAT:0.093 ID X 0.281 OD X 0.02,STL	12327	ORDER BY DESCR
-95	220-0619-00			2	.NUT,PLAIN,PLATE:2-56 X 0.6 X 0.063,AL (END ATTACHING PARTS)	80009	220-0619-00
-96	-----			1	.CKT BOARD ASSY:READOUT(SEE A8 REPL) (ATTACHING PARTS)		
-97	211-0116-00	B010100	B090824	10	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,BRS,NP,POZ	77900	ORDER BY DESCR
	211-0292-00	B090825		10	.SCR,ASSEM WSHR:4-40 X 0.29,PNH,BRS NI PL (END ATTACHING PARTS)	78189	51-040445-01
	131-0157-00			2	.TERMINAL,PIN:0.25 L X 0.04 OD,BRS,SLDR PL	18310	1100-34-0519
-98	131-0604-00			12	..CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-99	131-0590-00			6	..TERMINAL,PIN:0.71 L X 0.025 SQ PH BRZ	22526	47331
	131-0589-00			5	..TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
	210-0406-00			4	.NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-100	200-1440-00			2	.COVER,CAM SW:26 ELEMENTS (ATTACHING PARTS)	80009	200-1440-00
-101	211-0116-00			4	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,BRS,NP,POZ	77900	ORDER BY DESCR
	210-0406-00			4	.NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL (END ATTACHING PARTS)	73743	12161-50
					.ACTR ASSY,CAM S:TIME/DIV(SEE S100 REPL) (ATTACHING PARTS)		
-102	211-0116-00			6	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,BRS,NP,POZ (END ATTACHING PARTS)	77900	ORDER BY DESCR
					.CAM SWITCH ASSY INCLUDES:		
-103	210-0406-00			7	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-104	131-0963-00			1	..CONTACT,ELEC:GROUNDING,PH BRZ,W/BACKET	TK0507	ORDER BY DESCR

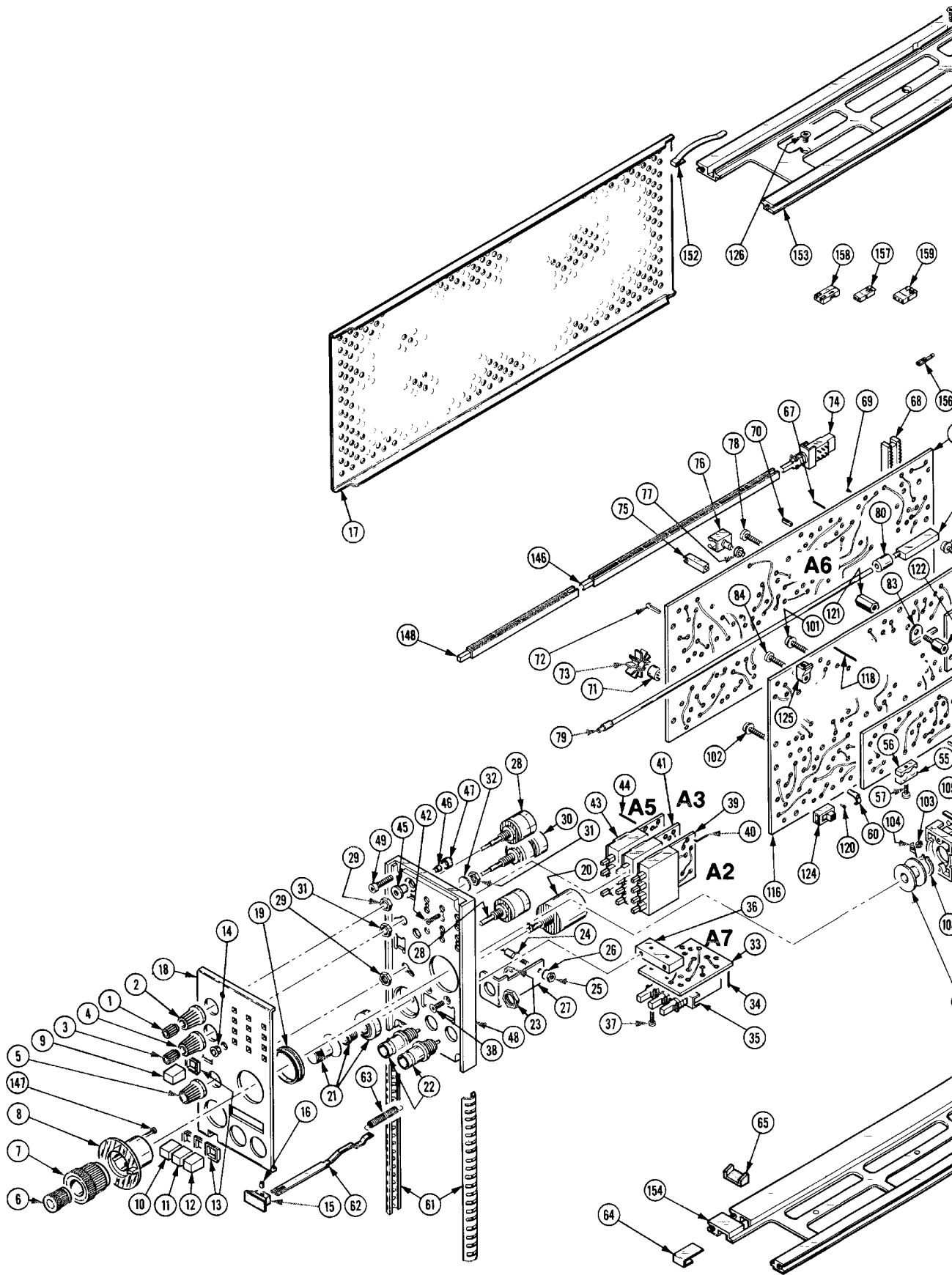
Replacable Mechanical Parts - 7B53A/7B53AN

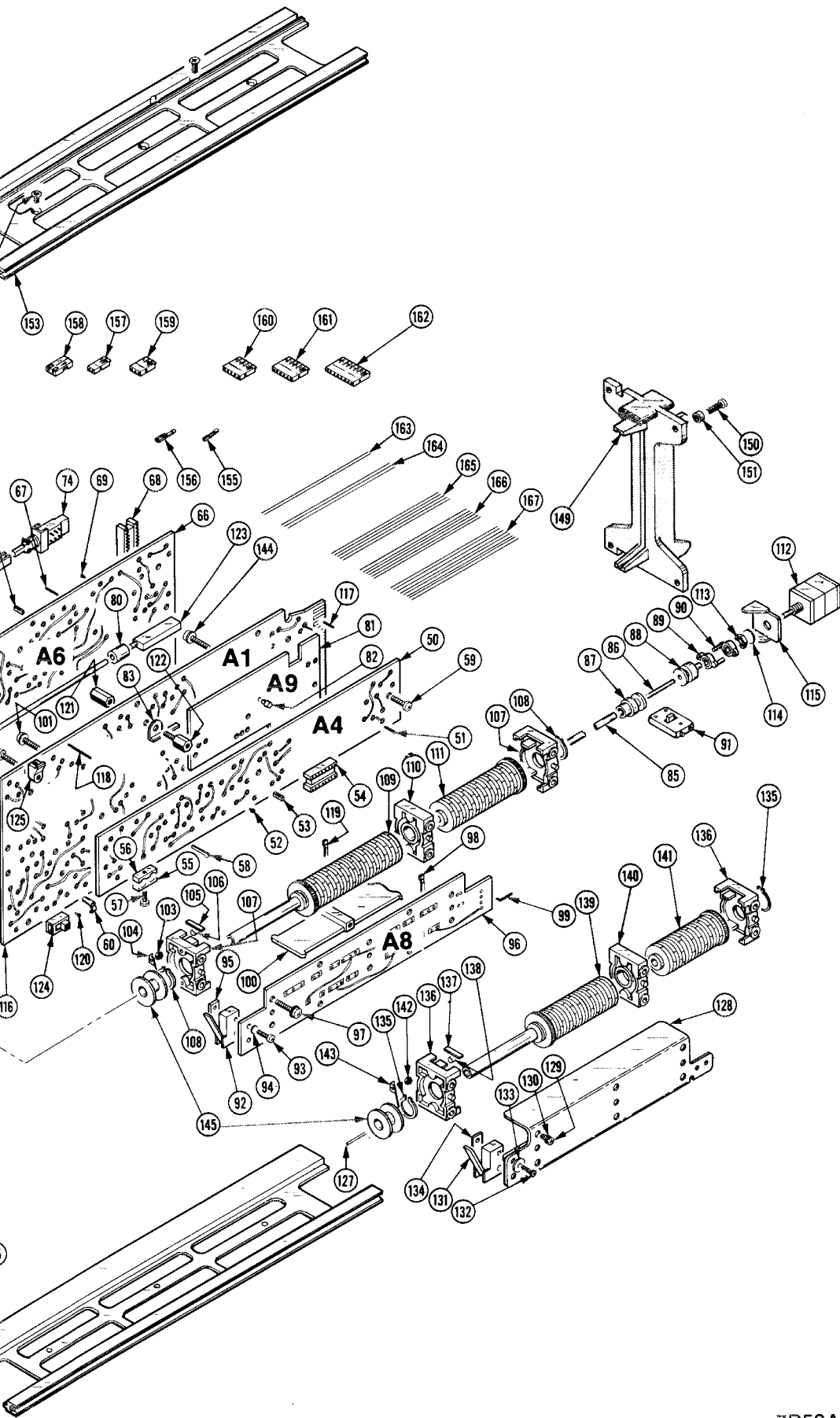
Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Discont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-105	214-1139-02			2	..SPRING,FLAT:0.885 X 0.156 CU BE GRN CLR ..(REPLACE ONLY WITH PART BEARING ..THE SAME COLOR CODE AS THE ORIGINAL ..PART IN YOUR INSTRUMENT)	80009	214-1139-02
	214-1139-03			2	..SPRING,FLAT:0.885 X 0.156 CU BE RED CLR ..(SEE FOOTNOTE ON FIG.1-105)	80009	214-1139-03
-106	214-1127-00	B010100	B179999	4	..ROLLER,DETENT:0.125 DIA X 0.125,SST	80009	214-1127-00
	214-1752-00	B180000		4	..ROLLER,DETENT:0.125 OD X 0.16,SST	80009	214-1752-00
-107	401-0081-02	B010100	B179999	2	..BEARING,CAM SW:FRONT W/O MOUNTING BOSSES	80009	401-0081-02
	401-0180-00	B180000		2	..BEARING,CAM SW:FR & REAR,0.80 & 0.83 DIA ..(ATTACHING PARTS)	80009	401-0180-00
-108	354-0391-00	B010100	B179999	2	..RING,RETAINING:BASIC EXT,U/O 0.438 DIA SFT	79136	5100-43 MD
	354-0390-00	B180000		1	..RING,RETAINING:BASIC EXT,U/O 0.375 DIA SFT ..(END ATTACHING PARTS)	79136	5100-37-ZD
	384-0878-04	B180000		1	..SHAFT,CAM SW:2.868 L X 0.248 OD OUTER ..CONCENTRIC W/DRIVER	80009	384-0878-04
-109	105-0386-00	B010100	B179999	1	..ACTUATOR,CAM SW:TIME/CM,FRONT ..(7B53A ONLY)	80009	105-0386-00
	105-0386-01	B180000		1	..ACTUATOR,CAM SW:TIME/CM,FRONT ..(7B53A ONLY)	80009	105-0386-01
	210-0406-00			4	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-110	401-0115-00	B010100	B179999	1	..BEARING,CAM SW:CENTER,0.83 DIA CAM	80009	401-0115-00
	401-0178-00	B180000		1	..BEARING,CAM SW:CENTER/REAR	80009	401-0178-00
-111	105-0387-00	B010100	B179999	1	..ACTUATOR,CAM SW:TIME/CM,REAR ..(7B53A ONLY)	80009	105-0387-00
	105-0387-01	B180000		1	..ACTUATOR,CAM SW:TIME/CM,REAR ..(7B53A ONLY)	80009	105-0387-01
-112	-----			1	..RESISTOR,VAR:(SEE R144/S144 REPL) ..(ATTACHING PARTS)		
-113	210-0583-00			1	..NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
-114	210-0046-00			1	..WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL ..(END ATTACHING PARTS)	77900	1214-05-00-0541C
-115	407-0803-00			1	..BRACKET,ELEC SW:BRASS	80009	407-0803-00
	175-3802-00	B23218		1	..CA ASSY,SP,ELEC:8,26 AWG,6.0 L,RIBBON	80009	175-3802-00
	352-0166-00	B23218		1	..HLDR,TERM CONN:8 WIRE,BLACK	80009	352-0166-00
	175-3803-00	B23218		1	..CA ASSY,SP,ELEC:3,26 AWG,10.0 L,RIBBON	80009	175-3803-00
	352-0161-02	B23218		1	..HLDR,TERM CONN:3 WIRE,RED	80009	352-0161-02
-116	-----			1	..CKT BOARD ASSY:INTERFACE(SEE A1 REPL)		
-117	131-0608-00			42	..TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
	131-0589-00			2	..TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
	131-0590-00			3	..TERMINAL,PIN:0.71 L X 0.025 SQ PH BRZ	22526	47331
	131-0592-00			37	..TERMINAL,PIN:0.885 L X 0.025 SQ BRS	22526	47333
-118	131-0595-00	B010100	B089999	10	..TERMINAL,PIN:1.37 L X 0.025 SQ BRS TIN PL	80009	131-0595-00
	131-0595-00	B090000		7	..TERMINAL,PIN:1.37 L X 0.025 SQ BRS TIN PL	80009	131-0595-00
	131-0665-00	B090000		1	..TERMINAL,PIN:0.88 L X 0.025 SQ,BRS TIN PL	22526	47338
-119	131-0604-00			35	..CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-120	136-0252-04	B010100	B113699	30	..SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0350-00	B113700		10	..SKT,PL-IN ELEC:TRANSISTOR,3 CONTACT	80009	136-0350-00
-121	129-0308-00			6	..SPACER,POST:0.465 L X 0.25 HEX,BRS ..(ATTACHING PARTS)	80009	129-0308-00
-122	129-0339-00			4	..SPACER,POST:0.28 L,4-40 TAP/STUD,BRS	80009	129-0339-00
	211-0008-00			6	..SCREW,MACHINE:4-40 X 0.25,PNH,STL ..(END ATTACHING PARTS)	93907	ORDER BY DESCR
-123	-----			1	..RESISTOR,VAR:(SEE R290 REPL)		
-124	-----			2	..SWITCH,SLIDE:(SEE S251,S262 REPL)		
	129-0339-00			2	SPACER,POST:0.28 L,4-40 TAP/STUD,BRS	80009	129-0339-00
-125	220-0547-01			6	NUT BLOCK:4-40 X 0.282,NI SIL NP (ATTACHING PARTS)	80009	220-0547-01
-126	211-0105-00			6	SCREW,MACHINE:4-40 X 0.188,FLH,100 DEG (END ATTACHING PARTS) CKT BOARD ASSY:INTERFACE(SEE A1 REPL) (7B53AN ONLY)	TK0435	ORDER BY DESCR
	131-0595-00	B010100	B089999	8	..TERMINAL,PIN:1.37 L X 0.025 SQ BRS TIN PL	80009	131-0595-00
	131-0595-00	B090000		7	..TERMINAL,PIN:1.37 L X 0.025 SQ BRS TIN PL	80009	131-0595-00
	131-0665-00	B090000		1	..TERMINAL,PIN:0.88 L X 0.025 SQ,BRS TIN PL	22526	47338
	131-0590-00			3	..TERMINAL,PIN:0.71 L X 0.025 SQ PH BRZ	22526	47331
	131-0589-00			2	..TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
	131-0604-00			35	..CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscnt	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-	131-0608-00			29	.TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
	136-0252-04	B010100	B113699	30	.SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
	136-0350-00	B137000		10	.SKT,PL-IN ELEK:TRANSISTOR,3 CONTACT	80009	136-0350-00
	214-0579-00			2	.TERM,TEST POINT:BRS CD PL	80009	214-0579-00
	260-0960-01			1	.SWITCH,SLIDE:FORM Z,0.5A,120VDC,BLACK BTTN	10389	23-021-043
	348-0056-00	B191300		1	.GROMMET,PLASTIC:GRAY,ROUND,0.332 ID	80009	348-0056-00
	129-0308-00			6	.SPACER,POST:0.465 L X 0.25 HEX,BRS	80009	129-0308-00
	129-0339-00			3	.SPACER,POST:0.28 L,4-40 TAP/STUD,BRS	80009	129-0339-00
	376-0101-00			1	.CPLG,SHAFT,RGD:0.125 ID X 0.312 OD,AL	80009	376-0101-00
	384-1120-00			1	.EXTENSION SHAFT:10.0 L X 0.123 OD,EPOXY GL	80009	384-1120-00
	210-0583-00			1	.NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
	210-0046-00			1	.WASHER,LOCK:0.261 ID,INTL,0.018 THK,STL	77900	1214-05-00-0541C
	407-0803-00			1	.BRACKET,ELEC SW:BRASS	80009	407-0803-00
-127	384-0838-00			1	.SHAFT,CAM SW:INNER CONCENTRIC W/DRIVER	80009	384-0838-00
	105-0326-00			1	.ACTR ASSY,CAM S:TIME/CM (7B53AN ONLY)	80009	105-0326-00
	334-3448-00	B191010		1	.MARKER,IDENT:MARKED NOTICE	07416	ORDER BY DESC
-128	200-1310-00			1	.COVER,CAM SW:36 ELEMENTS ..(ATTACHING PARTS)	80009	200-1310-00
-129	211-0008-00			6	.SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESC
-130	210-0004-00			6	.WASHER,LOCK:#4 INTL,0.015 THK,STL ..(END ATTACHING PARTS)	77900	1204-00-00-0541C
-131	260-1309-00			1	.SWITCH,SENS:SPDT,5A,250AC,MOM ..(ATTACHING PARTS)	01963	E63-10H
-132	211-0159-00			2	.SCREW,MACHINE:2-56 X 0.375,PNH,STL	TK0435	1183-302
-133	210-0850-00			2	.WASHER,FLAT:0.093 ID X 0.281 OD X 0.02,STL	12327	ORDER BY DESC
-134	220-0619-00			1	.NUT,PLAIN,PLATE:2-56 X 0.6 X 0.063,AL ..(END ATTACHING PARTS)	80009	220-0619-00
	384-0838-00			1	.SHAFT,CAM SW:INNER CONCENTRIC W/DRIVER ..(7B53AN ONLY)	80009	384-0838-00
-135	354-0391-00			2	.RING,RETAINING:BASIC EXT,U/O 0.438 DIA SFT	79136	5100-43 MD
-136	401-0081-02			2	.BEARING,CAM SW:FRONT W/O MOUNTING BOSSES	80009	401-0081-02
-137	214-1139-00			AR	.SPRING,FLAT:0.885 X 0.156 CU BE GLD CLR ..(REPLACE ONLY WITH PART BEARING THE ..SAME COLOR CODE AS THE ORIGINAL PART ..IN YOUR INSTRUMENT)	80009	214-1139-00
	214-1139-02			AR	.SPRING,FLAT:0.885 X 0.156 CU BE GRN CLR ..(SEE FOOTNOTE ON FIG.1-137)	80009	214-1139-02
	214-1139-03			AR	.SPRING,FLAT:0.885 X 0.156 CU BE RED CLR ..(SEE FOOTNOTE ON FIG.1-137)	80009	214-1139-03
-138	214-1127-00			4	.ROLLER,DETENT:0.125 DIA X 0.125,SST	80009	214-1127-00
-139	105-0325-00			1	.ACTUATOR,CAM SW:TIME/CM,FRONT	80009	105-0325-00
-140	401-0115-00			1	.BEARING,CAM SW:CENTER,0.83 DIA CAM	80009	401-0115-00
-141	105-0324-00			1	.ACTUATOR,CAM SW:TIME/CM,REAR	80009	105-0324-00
-142	210-0406-00			11	.NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-143	131-0963-00			1	.CONTACT,ELEC:GROUNDING,PH BRZ,W/BACKET ..(ATTACHING PARTS FOR ACTR ASSY)	TK0507	ORDER BY DESC
-144	211-0116-00			6	.SCR,ASSEM WSHR:4-40 X 0.312,PNH,BRS,NP,POZ (END ATTACHING PARTS)	77900	ORDER BY DESC
	384-0838-00			1	.SHAFT,CAM SW:INNER CONCENTRIC W/DRIVER	80009	384-0838-00
-145	214-1597-00			1	ADAPTER,SW ACTR:0.252 ID X 0.75 OD X 0.425, PLASTIC	80009	214-1597-00
-146	384-1059-00			1	EXTENSION SHAFT:6.58 L	80009	384-1059-00
-147	384-1087-00			1	SHAFT,PUSH,ACTR:0.76 L X 0.065 STEPPED	80009	384-1087-00
-148	384-1101-00			1	EXTENSION SHAFT:4.14 L X 0.187 SQ,PLASTIC	80009	384-1101-00
-149	386-1402-00	B010100	B243712	1	PANEL,REAR:	80009	386-1402-00
	386-5466-00	B243713		1	PANEL,REAR: (ATTACHING PARTS)	80009	386-5466-00
-150	213-0192-00	B010100	B220204	4	SCREW,TPG,TF:6-32 X 0.5,SPCL TYPE,FILH,STL	87308	ORDER BY DESC
	213-0793-00	B220205		4	SCREW,TPG,TF:6-32 X 0.4375,TAPTITE,FILH	83486	239-006-406043
-151	361-0326-00			1	SPACER,SLEEVE:0.1 L X 0.18 ID,AL (NO LONGER USED) (END ATTACHING PARTS)	80009	361-0326-00
-152	214-1061-00			1	CONTACT,ELEC:GROUNDING,CU BE	80009	214-1061-00
-153	426-0505-11			1	FR SECT,PLUG-IN:TOP	80009	426-0505-11
-154	426-0499-11			1	FR SECT,PLUG-IN:BOTTOM	80009	426-0499-11
	198-2121-00	B010100	B232179	1	WIRE SET,ELEC:	80009	198-2121-00
	198-2121-02	B231780		1	WIRE SET,ELEC:	80009	198-2121-02

Replaceable Mechanical Parts - 7B53A/7B53AN

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No.		Qty	12345 Name & Description	Mfr.	
		Effective	Dscont			Code	Mfr. Part No.
1-155	131-0707-00	8010100	B232179	58	.CONTACT, ELEC:22-26 AWG,BRS,CU BE GLD PL	22526	47439-000
	131-0707-00	B231780		47	.CONTACT, ELEC:22-26 AWG,BRS,CU BE GLD PL	22526	47439-000
	131-0708-00			4	.CONTACT, ELEC:28-32 AWG,BRS,CU BE GLD PL	22526	47437-000
-156	131-0621-00			4	.CONN, TERM:22-26 AWG,BRS,CU BE GLD PL	22526	46231-000
	131-0622-00			2	.CONTACT, ELEC:28-32 AWG,BRS & CU BE GLD PL	22526	46241-000
	131-0792-00			2	.CONNECTOR, TERM:18-20 AWG,CU BE GOLD PL	22526	46221
-157	352-0169-00			4	.HLDR, TERM CONN:2 WIRE, BLACK	80009	352-0169-00
-158	352-0198-00			4	.HLDR, TERM CONN:2 WIRE, BLACK	80009	352-0198-00
-159	352-0161-00			2	.HLDR, TERM CONN:3 WIRE, BLACK	80009	352-0161-00
	352-0161-02	8010100	B232179	1	.HLDR, TERM CONN:3 WIRE, RED	80009	352-0161-02
-160	352-0163-00			3	.HLDR, TERM CONN:5 WIRE, BLACK	80009	352-0163-00
-161	352-0164-00			4	.HLDR, TERM CONN:6 WIRE, BLACK	80009	352-0164-00
-162	352-0166-00	8010100	B232179	1	.HLDR, TERM CONN:8 WIRE, BLACK	80009	352-0166-00
-163	175-0825-00			AR	.CABLE, SP, ELEC:2,26 AWG, STRD, PVC JKT, RBN	80009	175-0825-00
-164	175-0826-00			AR	.CABLE, SP, ELEC:3,26 AWG, STRD, PVC JKT, RBN	80009	175-0826-00
-165	175-0828-00			AR	.CABLE, SP, ELEC:5,26 AWG, STRD, PVC JKT, RBN	08261	111-2699-955
-166	175-0829-00			AR	.CABLE, SP, ELEC:6,26 AWG, STRD, PVC JKT, RBN	08261	111-2699-973
-167	175-0831-00	8010100	B232179	AR	.CABLE, SP, ELEC:8,26 AWG, STRD, PVC INSUL, RBN	08261	111-2699-971
	198-2443-00			1	WIRE SET, ELEC:	80009	198-2443-00
	131-0707-00			1	.CONTACT, ELEC:22-26 AWG,BRS,CU BE GLD PL	22526	47439-000
	131-0708-00			1	.CONTACT, ELEC:28-32 AWG,BRS,CU BE GLD PL	22526	47437-000
	175-0821-00			AR	.WIRE, ELECTRICAL:STRD,30 AWG,250V RMS, GREEN, .PVC, SIL PLD COPPER	TK0282	30-MT-738-UL-5
	352-0169-00			1	.HLDR, TERM CONN:2 WIRE, BLACK	80009	352-0169-00
					STANDARD ACCESSORIES		
	070-1342-01			1	MANUAL, TECH: INSTR, 7B53A/7B53AN	80009	070-1342-01





7B53A/7B53AN DUAL TIME BASE

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Date: 5/6/88 Change Reference: C110/0588 Rev 2

Manual Part No.: see product

Product: All 7000 Service manuals

Product Group: 42

DESCRIPTION

Effective for all serial numbers.

Revised 9/26/88
Revised 10/13/88

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

The part number has changed for a transistor which may be used in your 7000-Series product. Part number 151-0220-00 has changed to 151-0220-07. Use the new 151-0220-07 part number when ordering a replacement for transistors listed as 151-0220-00 in your Replaceable Electrical Parts List.

Most berg sockets, part number 136-0252-07, have been removed from this 7000-Series instrument to facilitate assembly and improve reliability.